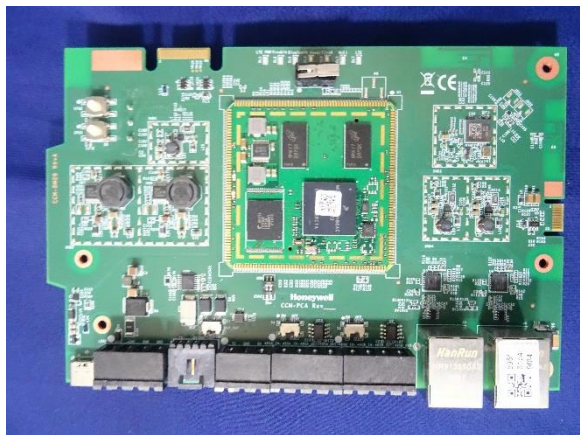


Prüfbericht – Produkte

Test Report - Products

Prüfbericht-Nr.: Test report no.:	ULR-TC568822300000046F	Auftrags-Nr.: Order no.:	146673778 010	Seite 1 von 51 Page 1 of 51	
Kunden-Referenz-Nr.: Client reference no.:	2024735	Auftragsdatum: Order date:	2021-04-22		
Auftraggeber: Client:	Honeywell International Inc 12, Clintonville Rd, Northford, CT, USA 06472; +1 203 4847161				
Prüfgegenstand: Test item:	CGW-MB SOM				
Bezeichnung Identification	CGW-MB	Serien -Nr.: Serial no.:	850020000300129B70045		
Auftrags-Inhalt: Order content:	Testing and issue of Test Report and Grant Certificate				
Prüfgrundlage: Test specification:	FCC Part 15 Subpart C 15.247,15.205 & 15.209 RSS 247 Issue 2,RSS Gen Issue 5				
Wareneingangsdatum: Date of sample receipt:	2022-04-15				
Prüfmuster-Nr.: Test sample no:	A002842870-1				
Prüfzeitraum: Testing period:	2022-04-23 - 2022-04-27				
Ort der Prüfung: Place of testing:	Wireless laboratory, Bangalore				
Prüflaboratorium: Testing laboratory:	TÜV Rheinland (India) Pvt. Ltd. 27/B,2nd cross road, Electronic city Phase1, Bangalore-560100, India FCC Test Site Registration No: 496599 IC Test Site Registration Number: 3665-1 CAB ID: IN0002				
Prüfergebnis*: Test result*:	Pass				
geprüft von: tested by:	genehmigt von: authorized by:				
Datum: Date: 2022-05-17	Ausstellatum: Issue date: 2022-06-08				
Stellung / Position:	Yogesh V Engineer	Stellung / Position:	Lokesh Ramu Manager		
Sonstiges / Other:	FCC ID: PV3CGWMB-SOM IC: 1609A-CGWMB-SOM				
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 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	5 = mangelhaft 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 F(ail) = failed a.m. test specification(s)	4 = sufficient N/A = not applicable	5 = poor 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>					

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000046F

Seite 2 von 51
Page 2 of 51

TEST SUMMARY

Test Item	Applicable Standard		Result
	FCC	ISED	
Maximum conducted (Peak) output power	FCC 15.247 (b)(3)	RSS 247 Issue 2, Section 5.4 (d)	Pass
Maximum Power Spectral Density	FCC 15.247(e)	RSS 247 Issue 2, Section 5.2 (b)	Pass
DTS Bandwidth	FCC 15.247(a)(2)	RSS 247 Issue 2, Section 5.2 (a)	Pass
Emissions in non-restricted frequency bands	FCC 15.247(d)	RSS 247 Issue 2, Section 5.5	Pass
Spurious Radiated Emissions and Restricted Bands of Operation	FCC 15.209 / FCC 15.205	RSS-Gen Issue 5, Section 8.9 /8.10	Pass
Conducted Spurious Emission on AC Power lines	FCC 15.207	RSS-Gen Issue 5,Section 8.8	Pass

Product Category: Electronics Testing
Test Discipline: EMC Test Facility

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000046F

Seite 3 von 51
Page 3 of 51

REVISION HISTORY OF THIS REPORT

Report Number	Version	Description	Issue date
ULR- TC568822300000046F	01	Initial issue of report	2022-05-30
ULR- TC568822300000046F	02	Updated Reviewer comments	2022-06-08

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	10
5	Operational Description	11
6	TEST METHODOLOGY	12
6.1	Radiated Emission Test	12
6.1.1	Test Setup Configuration	12
7	TEST RESULTS	14
7.1	Maximum Peak Conducted Output Power	14
7.2	Maximum Power Spectral Density	17
7.3	Occupied bandwidth.....	20
7.4	Emissions in non-restricted frequency bands and Conducted Spurious Emission.....	25
7.4.1	Band edge and reference plots	26
7.4.2	Out-Of-Band Emissions.....	29
7.5	Spurious Radiated Emissions & Restricted Bands of Operation	35
7.6	Conducted spurious emission Test on AC Power lines	47
8	LIST OF TABLES.....	51

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000046F

Seite 5 von 51
Page 5 of 51

1 GENERAL REMARKS

1.1 Attachments

All attachments are part of this test report and are issued in separate document

1. Test Setup photos
2. EUT External Photos
3. EUT Internal Photos
4. FCC Label and Label Location
5. Block Diagram
6. Specification of EUT
7. Schematic Diagrams
8. Bill of Material
9. User Manual
10. Maximum Permissible Exposure Information

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000046F

Seite 6 von 51
Page 6 of 51

2 TEST SITES

2.1 Testing Facilities

1. TÜV Rheinland (India) Pvt.Ltd.,
27/B, 2nd Cross,
ElectronicCityPhase1
Bangalore – 560 100,
India
2. TUV Rheinland (India) Pvt.Ltd.,
108 , Beside ISBR Business School,
Electronic city Phase I
Bangalore - 560 100,
India

2.2 List of Test and Measurement Instruments

Table 1: List of test and measurement instruments

Equipment	Manufacturer	Model Name	Serial Number	Firmware Versions	Calibration Due Date	Periodicity	Test Facility
EMI Receiver	Rohde & Schwarz	ESW 44	101773	4.73 SP5	12.02.2023	Yearly	Radiated Spurious Emission
Horn Antenna	Schwarz beck	BBHA 9120 D	9120D-1944	-	11.05.2022	Yearly	
Biconical Antenna	Schwarz beck	VHBB-9124 + BBA-9106	9124-1208+9106-0525	-	03.05.2022	Yearly	
Log-Periodic Antenna	Schwarz beck	VULP 9118 A	VULP9118A-0733	-	05.05.2022	Yearly	
Broadband Horn Antenna	Schwarz beck	BBHA 9170	BBHA 9170-0904	-	06.05.2022	Yearly	
Fully Anechoic Chamber	Albatross	-	-	-	-	-	
Signal Analyser	Rohde & Schwarz	FSV7	101644	FW 3.40	25.01.2023	Yearly	Antenna – Port Conducted Test (TS8997) system
OSP	Rohde & Schwarz	OSP120 Incl. B157	OSP120-101323 & B157-100894		17.12.2022	Yearly	
Signal Generator	Rohde & Schwarz	SMB100A	108788		27.01.2023	Yearly	
Vector Signal Generator	Rohde & Schwarz	SMBV100	260789		27.01.2023	Yearly	

Table 2: Instrument application Software versions

SL. No.	Test Type	Application software	Version
1	Radiated spurious emission measurement in SAC	BAT EMC	3.20.0.17
1	Radiated spurious emission measurement in FAC	EMC 32	10.60.00

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000046F

Seite 7 von 51
Page 7 of 51

3 GENERAL PRODUCT INFORMATION

3.1 Product Function and Intended Use

Gateway Connect is an embedded and intelligent gateway for connected buildings. It enables system maintenance providers as well as end users to remotely manage connected fire detection systems. The gateway also supports them to ensure compliance.

3.2 Ratings and System Details of Equipment under Test

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

Protocol		BLE
Operating Frequency Range		2402MHz – 2480MHz
No. of Channels		40
Channel Spacing		2MHz
Maximum Measured Power		8.05 dBm
Modulation		GFSK
Data Rate		1Mbps
Number of antennas		1
Antenna Gain & Antenna Type		3dBi & Printed F Antenna
Supply Voltage to Product		24V DC and NUP
Environmental conditions	Storage	-10°C to +60°C
		Relative humidity 5% to 95% RH
	Operating	-10°C to +60°C
		Relative humidity 5% to 95% RH
EUT Dimension		200mm x 70mm x 255mm

***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.

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000046F

Seite 9 von 51
Page 9 of 51

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: HON-CGW-MBB

Software Version: 3.0.1.16

Hardware version of identification Number (HVIN): CCM-BM28 RevA

Firmware version of identification Number (FVIN): 4.0.0.6

4.3 Special Accessories and Auxiliary Equipment

None

4.4 Countermeasures to achieve EMC Compliance

None

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000046F

Seite 10 von 51
Page 10 of 51

4.5 List of frequencies

Frequency Band (MHz)	Channel No.	Channel Frequency (MHz)
2400 – 2483.5	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 EUT Center frequencies

Channel used for EUT testing

Channel low : 2402MHz

Channel Mid : 2440MHz

Channel High : 2480MHz

Note:

1. TUV Sample Identification number : A002832870 – Radiated & Conducted test Sample

Prüfbericht - Nr.:

Test Report No.:

ULR-TC568822300000046F

Seite 11 von 51

Page 11 of 51

5 Operational Description

The CCM WiFi Circuit is a completely self contained SiP module by USI (U25). The WM-BAC-BM-28 Module is based on the CYW43455 WiFi Chipset and provides 802.11 a/b/g/n with Bluetooth 4.2. It interfaces to the host processor over SDIO for WiFi and UART for Bluetooth. The module requires an external 32.768KHz oscillator. The BM-28 is soldered to the main board. It has two integrated F shaped printed PCB antennas. A SPDT switch is used to control the RF path.

6 TEST METHODOLOGY

6.1 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

6.1.1 Test Setup Configuration

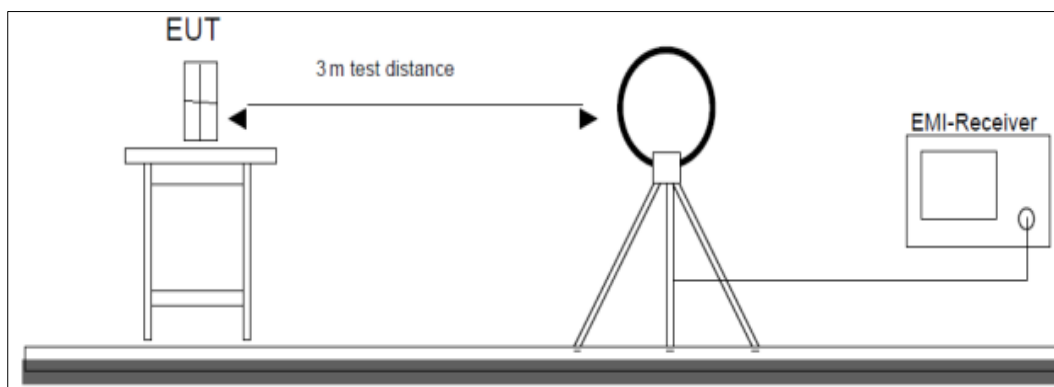


Figure 1: Frequency Range 9 kHz- 30 MHz

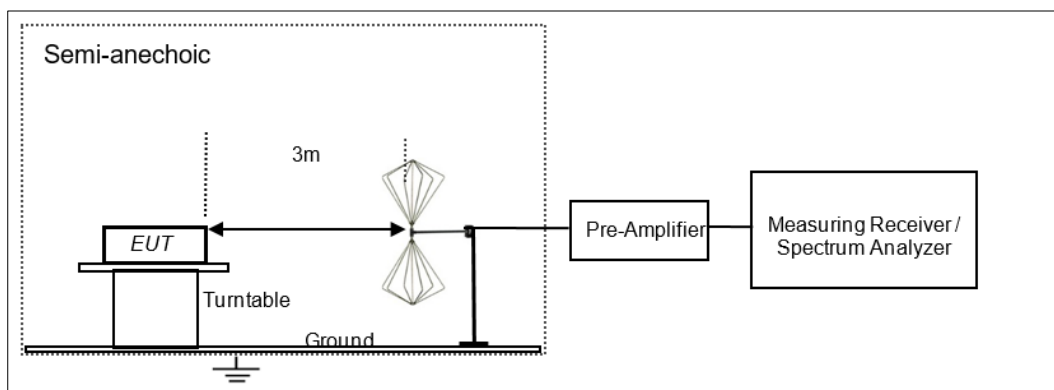


Figure 2: Frequency Range 30 MHz – 200 MHz

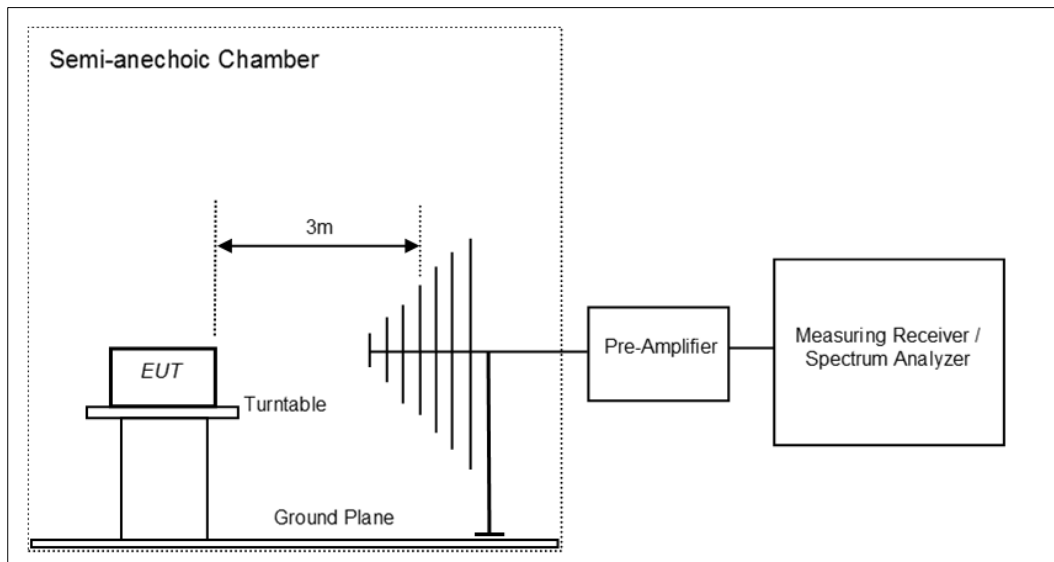


Figure 3: Frequency Range 200 MHz - 1GHz

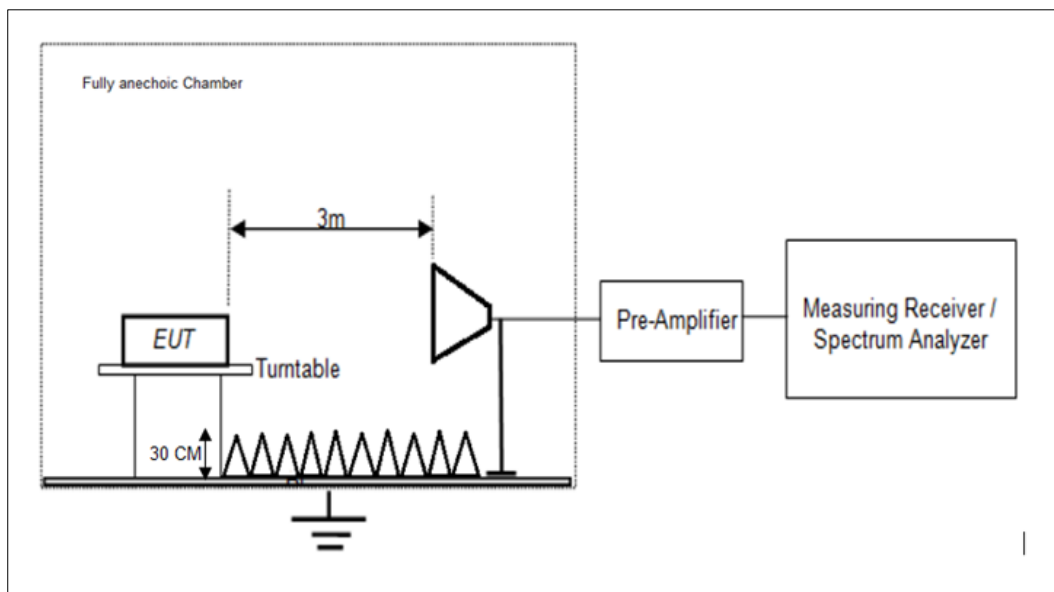


Figure 4: Frequency Range above 1 GHz

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000046F

Seite 14 von 51
Page 14 of 51

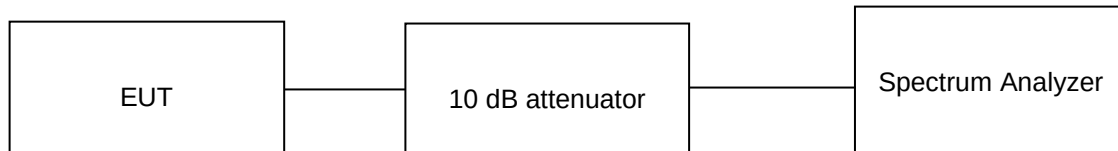
7 TEST RESULTS

7.1 Maximum Peak Conducted Output Power

Result

Pass

Test Specification	FCC part 15 Subpart C 15.247 (b)(3) / RSS 247 Issue 2, Section 5.4 (d)
Test Method	Subclause 11.9.1.1 of ANSI C63.10
Measurement Bandwidth	1MHz
Detector	Peak
Port of testing	Antenna port
Requirement	Power $\leq$ 1 W (30 dBm) & e.i.r.p $\leq$ 4 W (36 dBm)



Test Condition

Normal Test Condition:

Temperature (Norm) = + 23.0 °C Voltage = 24V DC and NUP Relative humidity: 64%

KDB Guidelines applied:

Measurements were made as per section 8.3.1.1 in KDB 558074 D01 15.247 Measurement Guidance v05r02.

Prüfbericht - Nr.:

Test Report No.:

ULR-TC568822300000046F

Seite 15 von 51

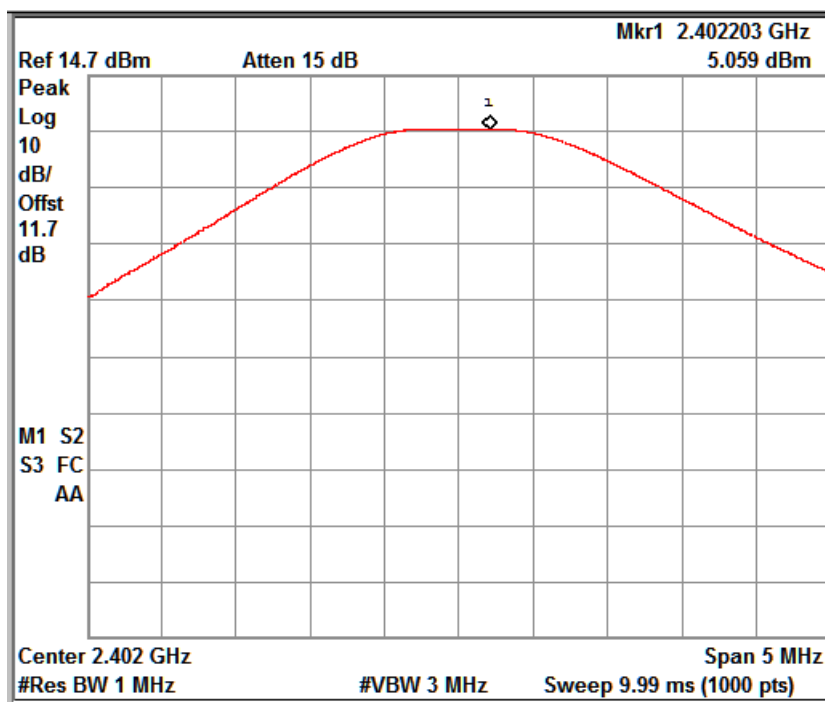
Page 15 of 51

Test results:

Note:

1. All the losses are included during measurement and final values are mentioned in the test report
2. Total Peak Output power (dBm) = Measured Peak power (dBm) + Attenuator factor (10dB) + Cable loss (1.7dB)
3. This product do not support additional beamforming gain / directional gain, it uses single antenna and hence Directional gain of the single antenna is 3 dBi

Data rate (Mbps)	Channel Frequency (MHz)	Measured Peak Power (dBm)	Maximum e.i.r.p (dBm)	Power Limit (dBm)	e.i.r.p limit (dBm)
1	2402	5.05	8.05	30	36
	2440	4.13	7.13	30	36
	2480	2.86	5.86	30	36

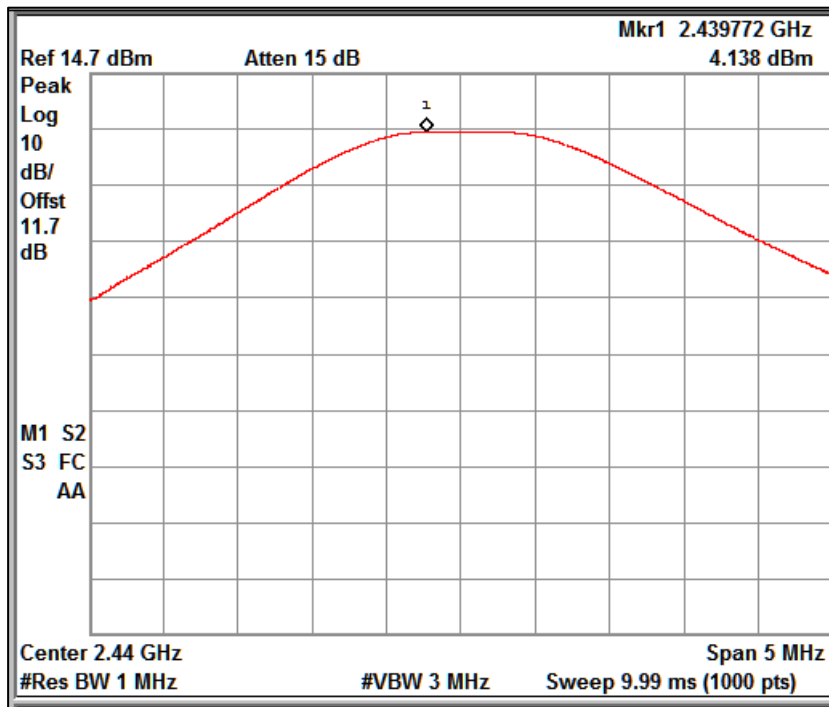


Channel Frequency: 2402MHz

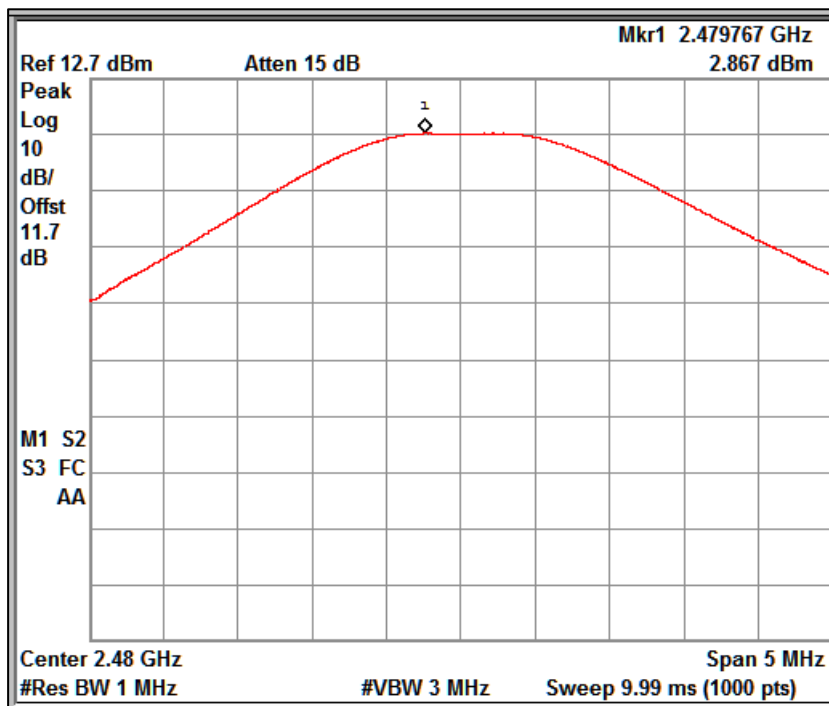
Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000046F

Seite 16 von 51
Page 16 of 51



Channel Frequency: 2440MHz



Channel Frequency: 2480MHz

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000046F

Seite 17 von 51
Page 17 of 51

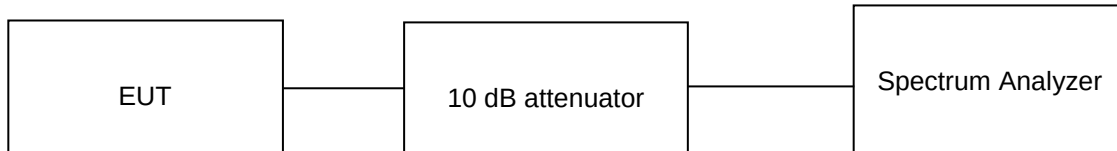
7.2 Maximum Power Spectral Density

Result

Pass

Test Specification	FCC part 15 Subpart C 15.247 (e) / RSS 247 Issue 2, Section 5.2 (b)
Test Method	Subclause 11.10.2 of ANSI C63.10
Measurement Bandwidth	100 kHz
Detector	Peak sample detector mode
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 Method:



Test Condition

Normal Test Condition:

Temperature (Norm) = + 23°C

Voltage = 24V DC and NUP

Relative humidity: 64 %

KDB Guidelines applied:

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

Prüfbericht - Nr.:

Test Report No.:

ULR-TC568822300000046F

Seite 18 von 51

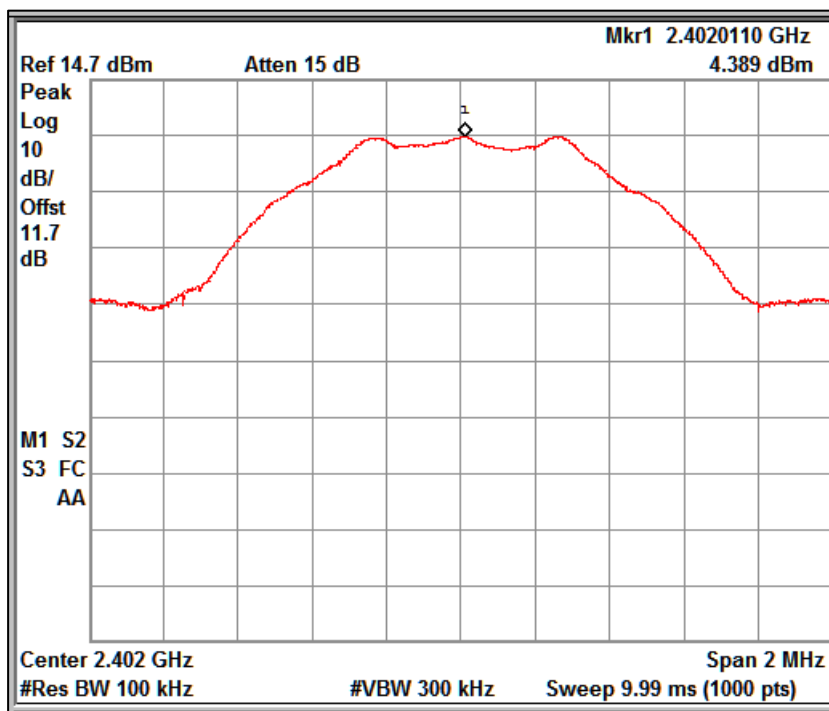
Page 18 of 51

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 (1.7dB)
3. This product do not support additional beamforming gain / directional gain, it uses single antenna and hence Directional gain of the single antenna is 3 dBi

Data rate (Mbps)	Channel Frequency (MHz)	Measured Peak PSD (dBm/100kHz)	PSD Limit (dBm/100kHz)
1	2402	4.38	8
	2440	3.53	8
	2480	2.24	8

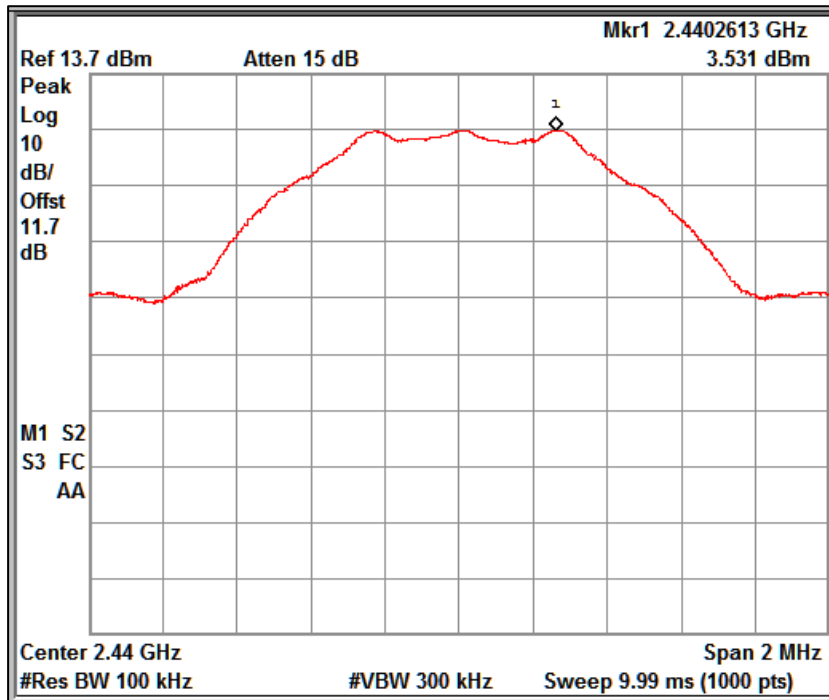


Channel Frequency: 2402MHz

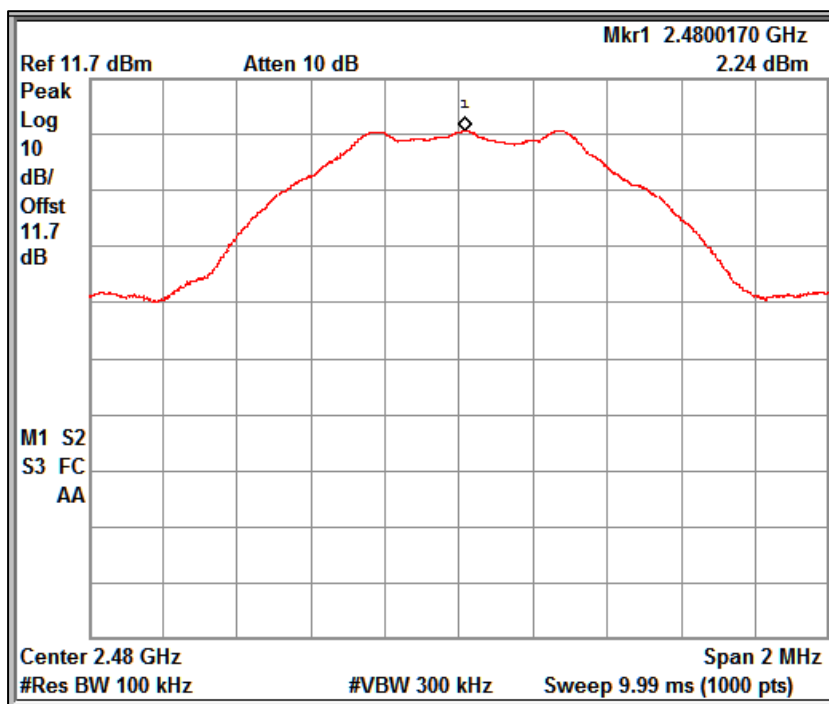
Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000046F

Seite 19 von 51
Page 19 of 51



Channel Frequency: 2440MHz



Channel Frequency: 2480MHz

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000046F

Seite 20 von 51
Page 20 of 51

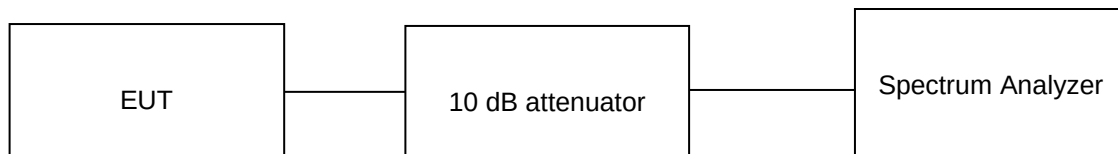
7.3 Occupied bandwidth

Result

Pass

Test Specification	FCC part 15 Subpart C 15.247 (a) (2) / RSS 247 Issue 2, Section 5.2 (a)
Test Method	Subclause 11.8.1 of ANSI C63.10
Measurement Bandwidth	100 kHz for x dB bandwidth 1 to 5% of OCB for 99% bandwidth
Detector	Peak
Port of testing	Antenna port
Requirement	The minimum 6 dB bandwidth shall be at least 500 kHz

Test Method:



Test Condition

Normal Test Condition:

Temperature (Norm) = + 23.0 °C Voltage = 24V DC Supply Relative humidity: 64%

KDB Guidelines applied:

Measurements were made as per section 8.2 in KDB 558074 D01 15.247 Measurement Guidance v05r02.

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000046F

Seite 21 von 51
Page 21 of 51

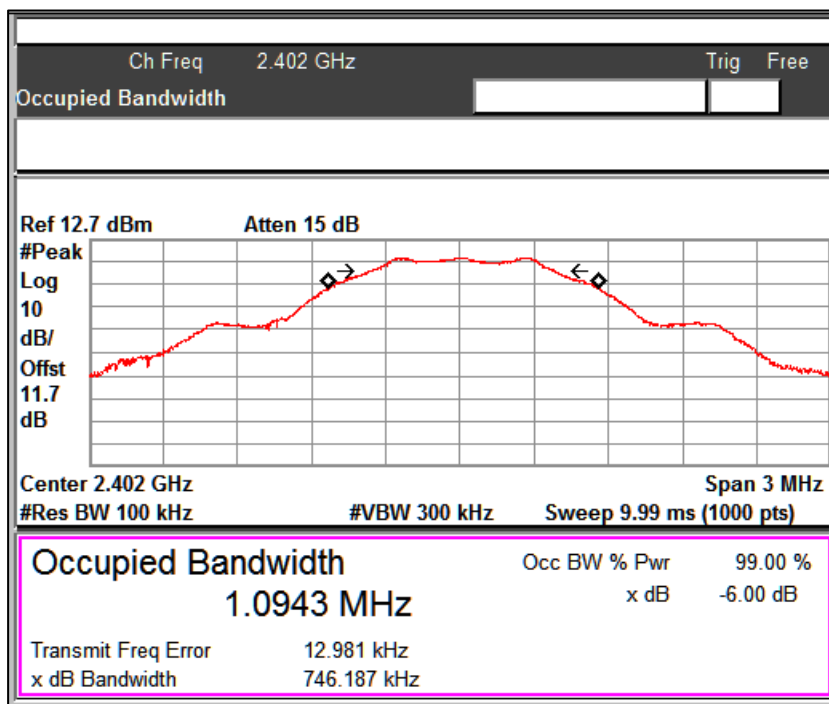
Test results:

Note:

1. All the losses are included during measurement and final values are mentioned in the test report.
2. Total Peak Output power (dBm) = Measured Peak power (dBm) + Attenuator factor (10dB) + Cable loss (1.7dB)
3. This product do not support additional beamforming gain / directional gain, it uses single antenna and hence Directional gain of the single antenna is 3 dBi

Channel Frequency (MHz)	6 dB Bandwidth (MHz)	99% OBW (MHz)
2402	0.74	1.05
2440	0.74	1.05
2480	0.73	1.05

Graphs for 6 dB bandwidth measurement

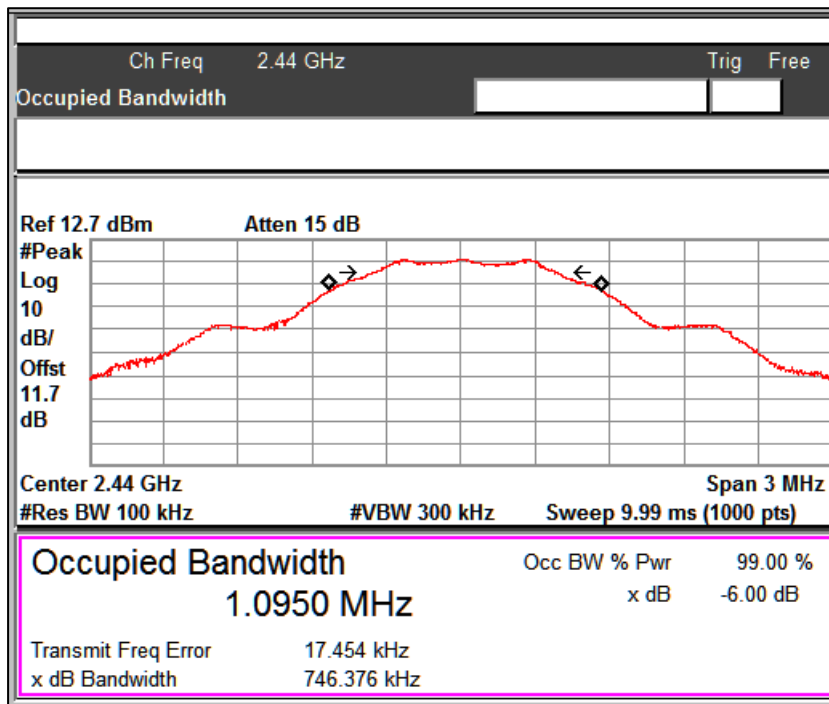


Channel Frequency: 2402MHz

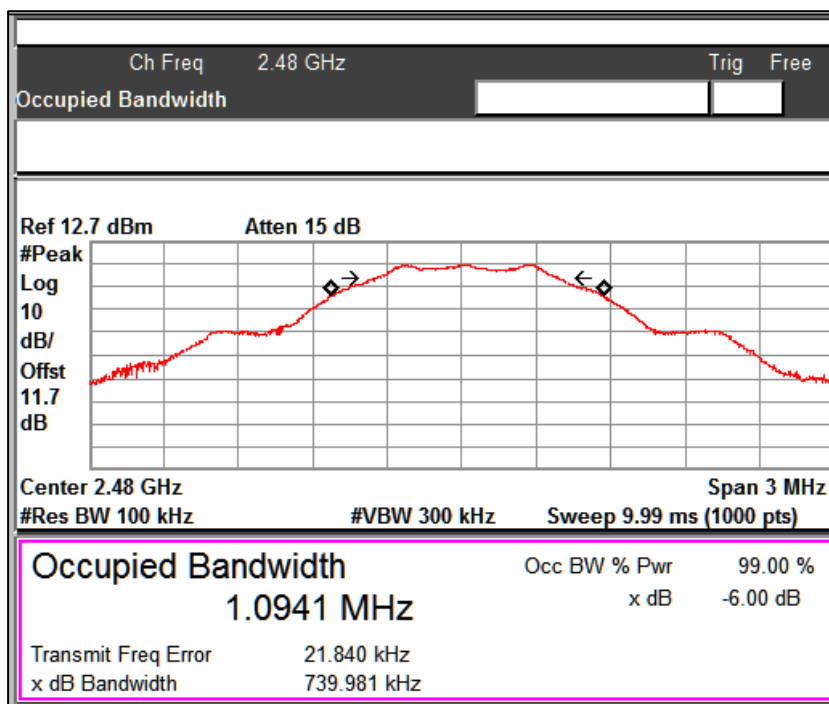
Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000046F

Seite 22 von 51
Page 22 of 51



Channel Frequency: 2440MHz



Channel Frequency: 2480MHz

Prüfbericht - Nr.:

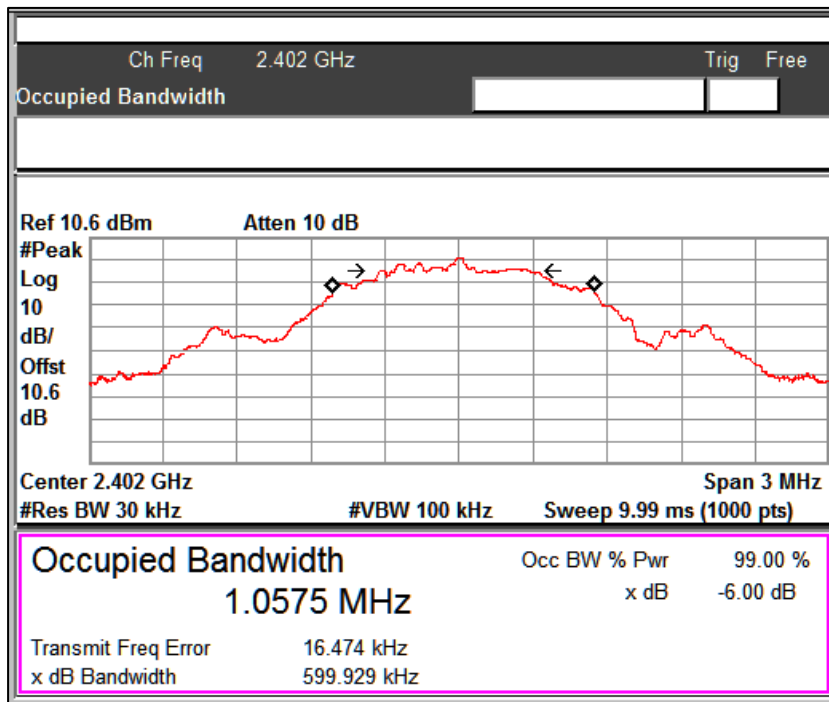
Test Report No.:

ULR-TC568822300000046F

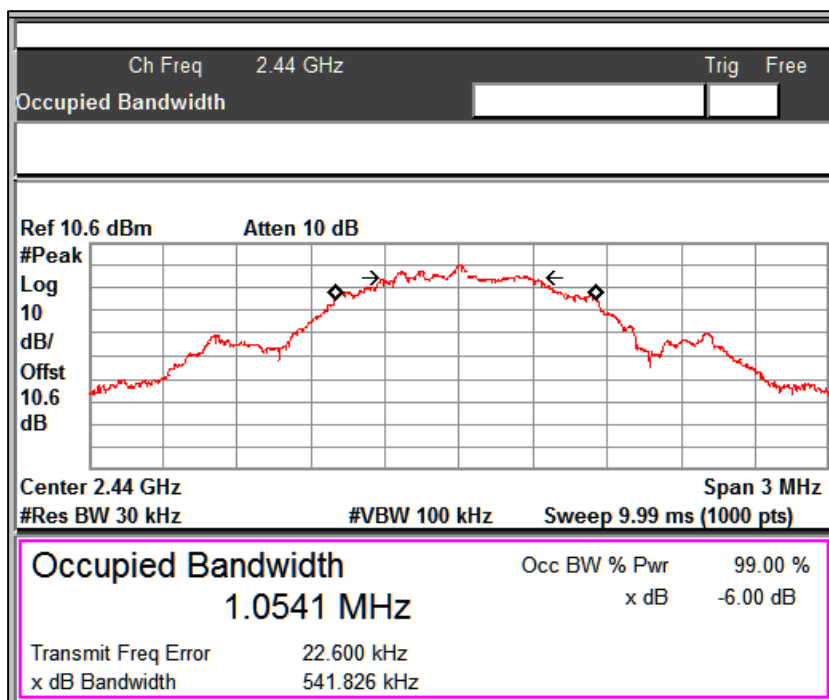
Seite 23 von 51

Page 23 of 51

Graphs for OCW 99% bandwidth measurement



Channel Frequency: 2402MHz



Channel Frequency: 2440MHz

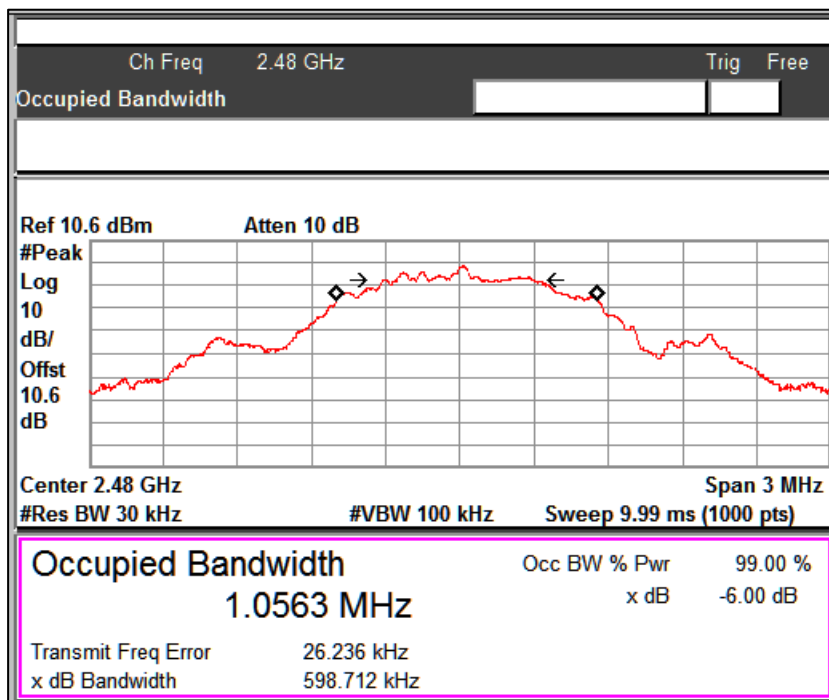
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568822300000046F

Seite 24 von 51

Page 24 of 51



Channel Frequency: 2480MHz

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000046F

Seite 25 von 51
Page 25 of 51

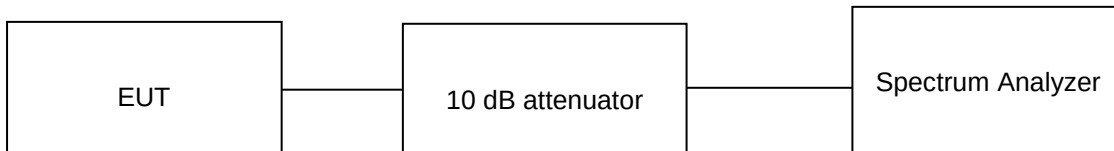
7.4 Emissions in non-restricted frequency bands and Conducted Spurious Emission

Result

Pass

Test Specification	FCC part 15 Subpart C 15.247 (d) / RSS 247 Issue 2, Section 5.5
Test Method	Subclause 11.11 of ANSI C63.10
Measurement Bandwidth	100 kHz
Detector	Peak
Port of testing	Antenna port
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 20dB 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 Method:



Test Condition

Normal Test Condition:

Temperature (Norm) = + 23.0 °C Voltage = 24V DC Supply Relative humidity: 64%

KDB Guidelines applied:

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

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000046F

Seite 26 von 51
Page 26 of 51

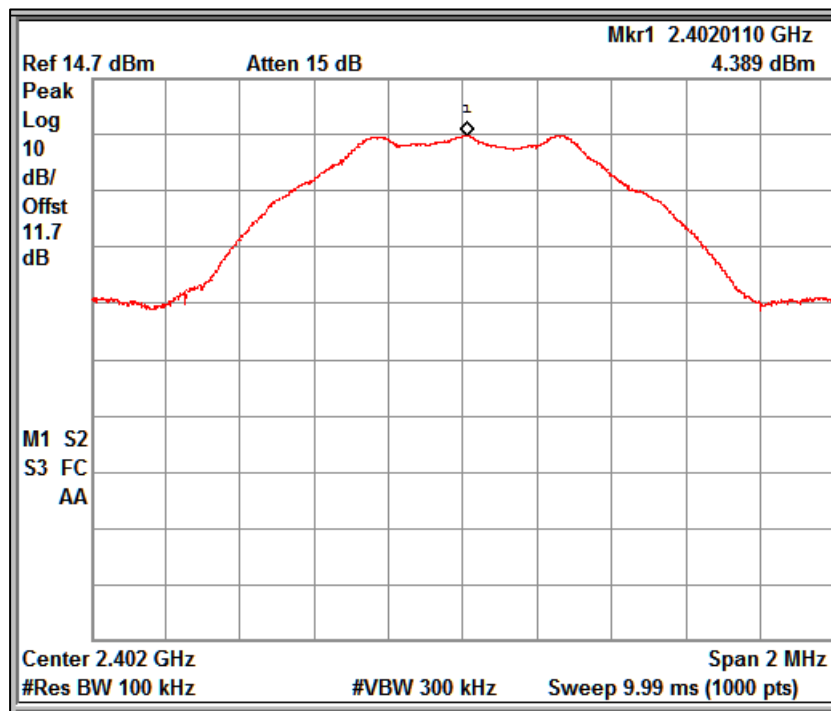
Test results:

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 (1.7dB)
3. This product do not support additional beamforming gain / directional gain, it uses single antenna and hence Directional gain of the single antenna is 3 dBi

7.4.1 Band edge and reference plots

Channel Frequency (MHz)	Band edge Frequency (MHz)	Value at Band edge (A) (dBm)	Reference Value (B) (dBm)	A-B (dBc)	Limit (dBc)
2402	2400.00	-50.81	4.38	-55.19	-20
2480	2483.50	-53.31	2.24	-55.55	-20

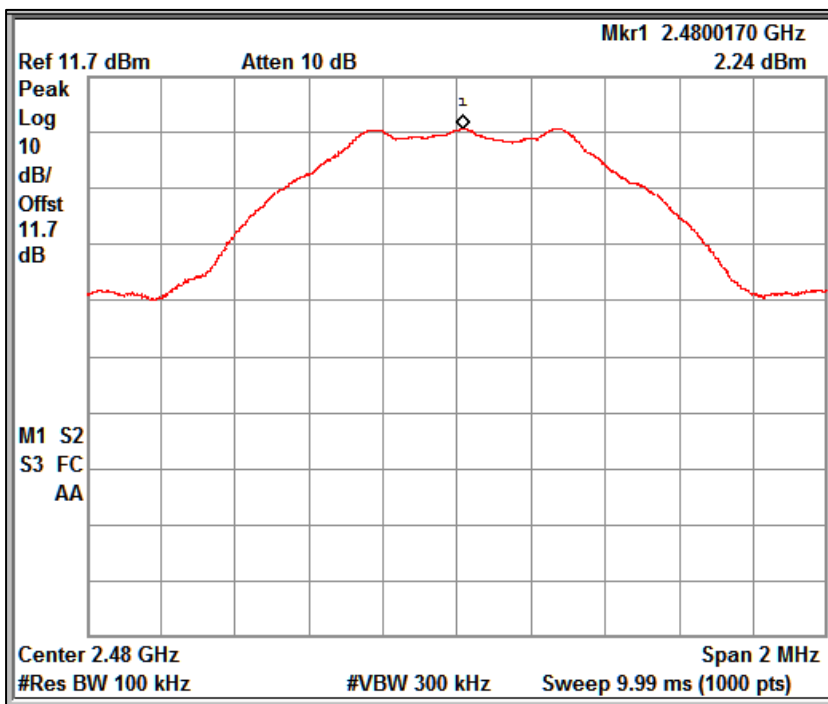


Reference plot for 2402MHz

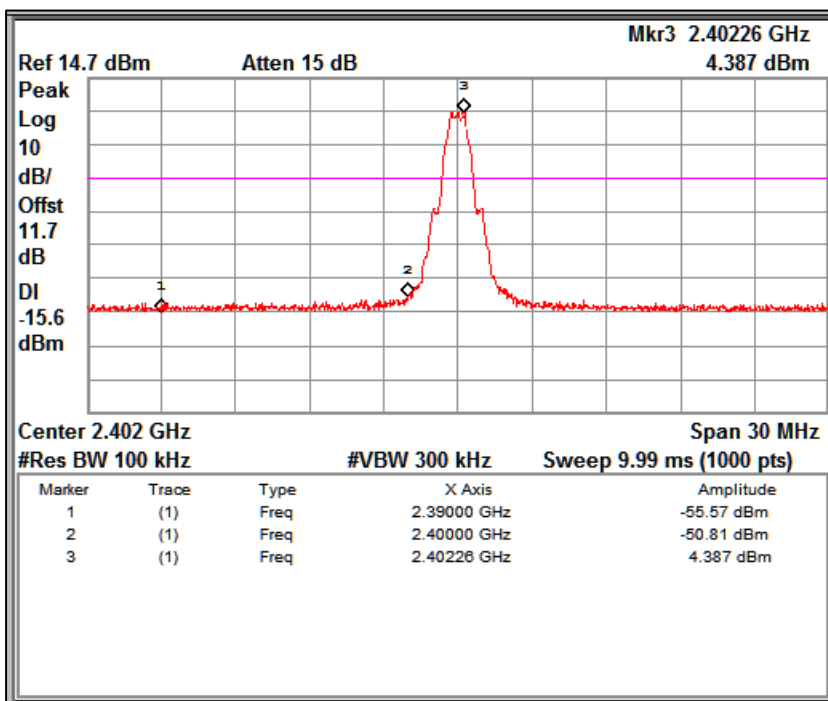
Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000046F

Seite 27 von 51
Page 27 of 51



Reference plot for 2480MHz



Band edge Channel Frequency 2402MHz

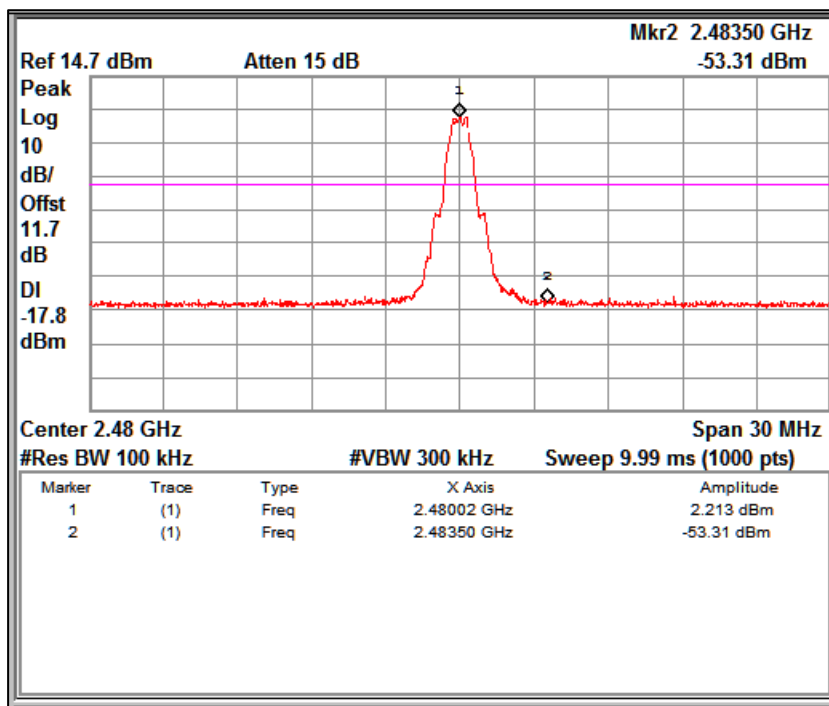
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568822300000046F

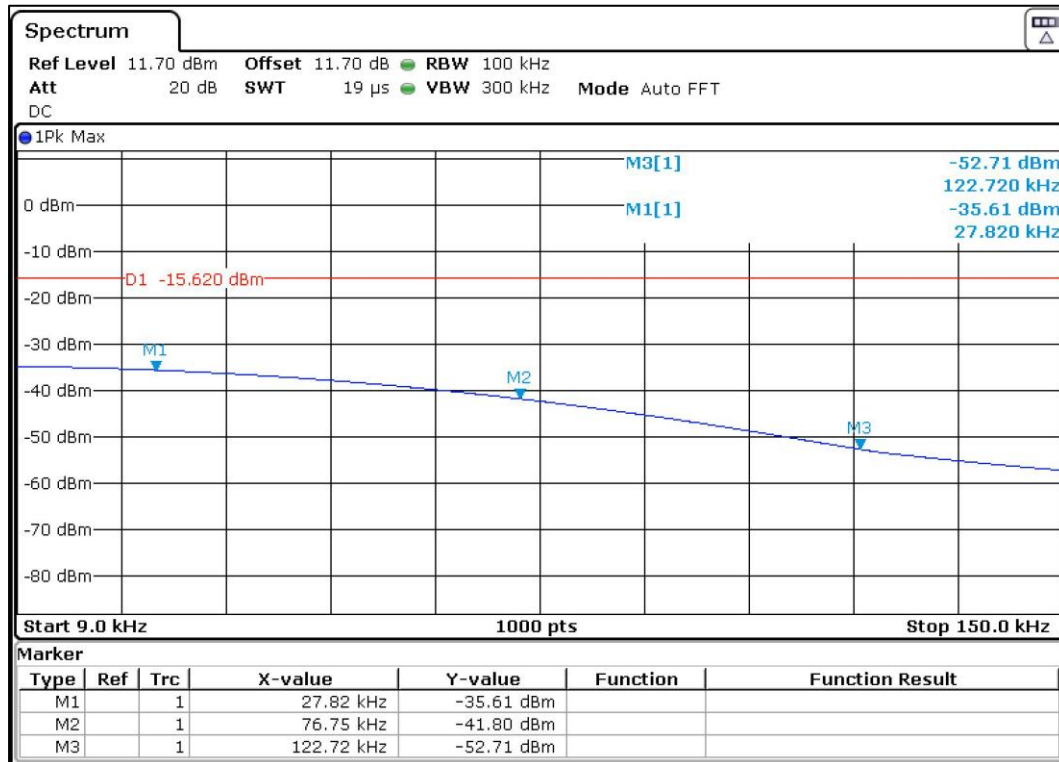
Seite 28 von 51

Page 28 of 51



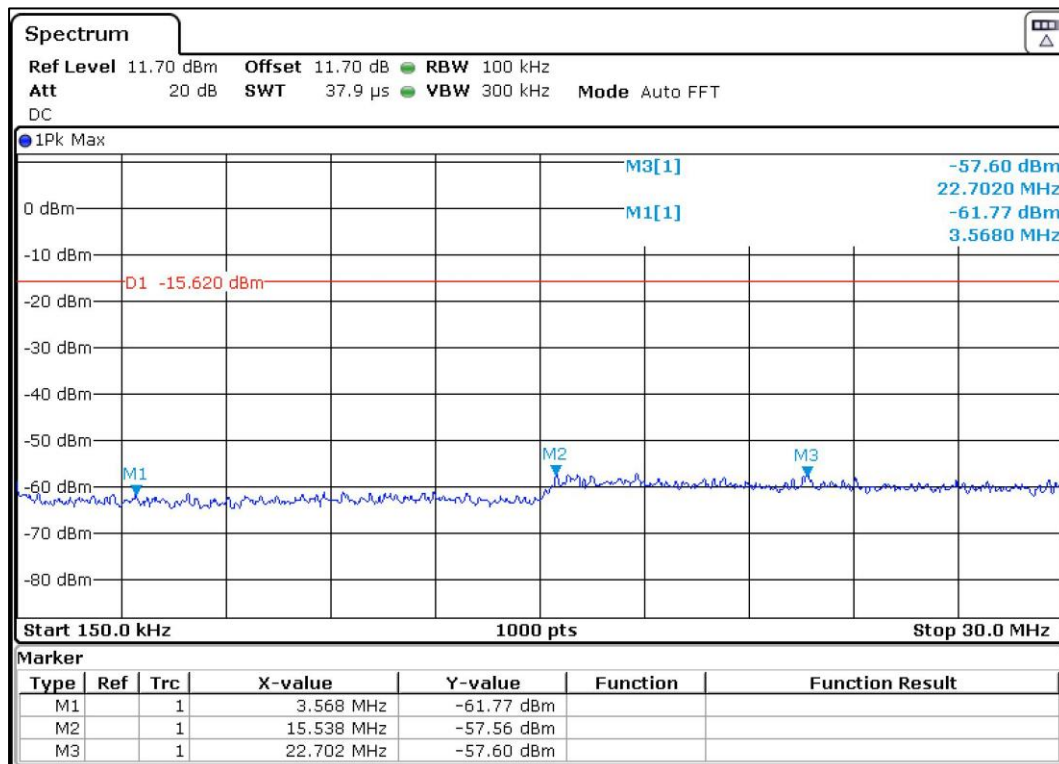
Band edge Channel Frequency 2480MHz

7.4.2 Out-Of-Band Emissions



Channel Frequency 2402MHz

Frequency Range 9KHz – 150KHz



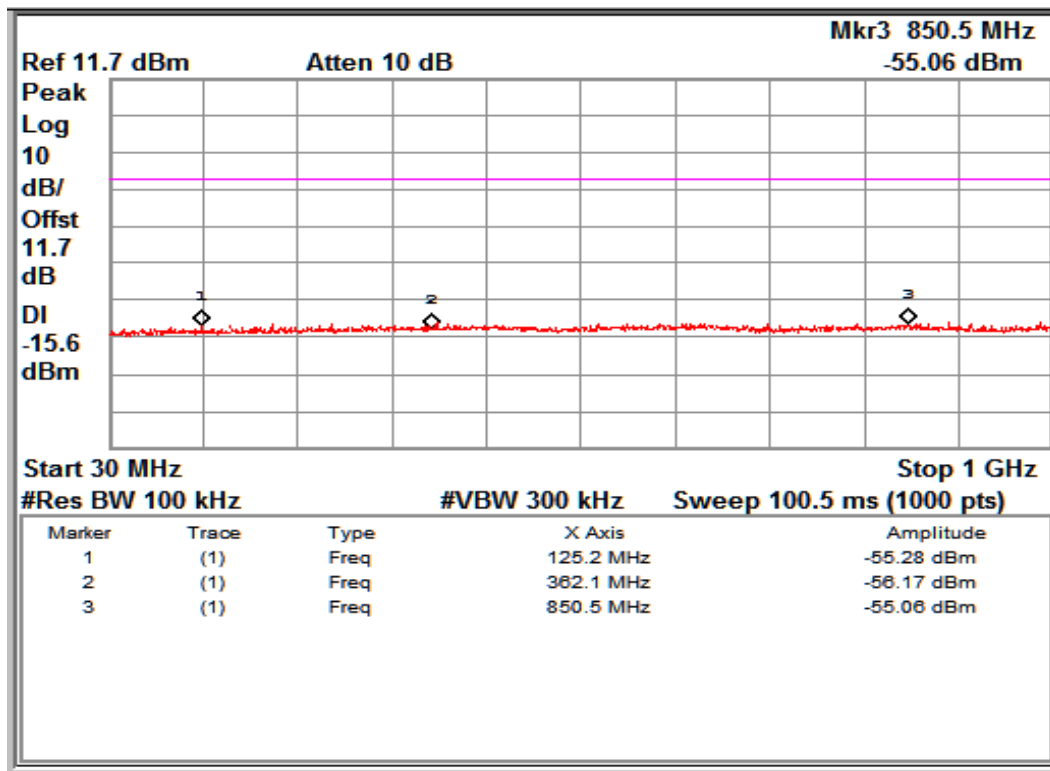
Channel Frequency 2402MHz

Frequency Range 150KHz – 30MHz

Prüfbericht - Nr.:
Test Report No.:

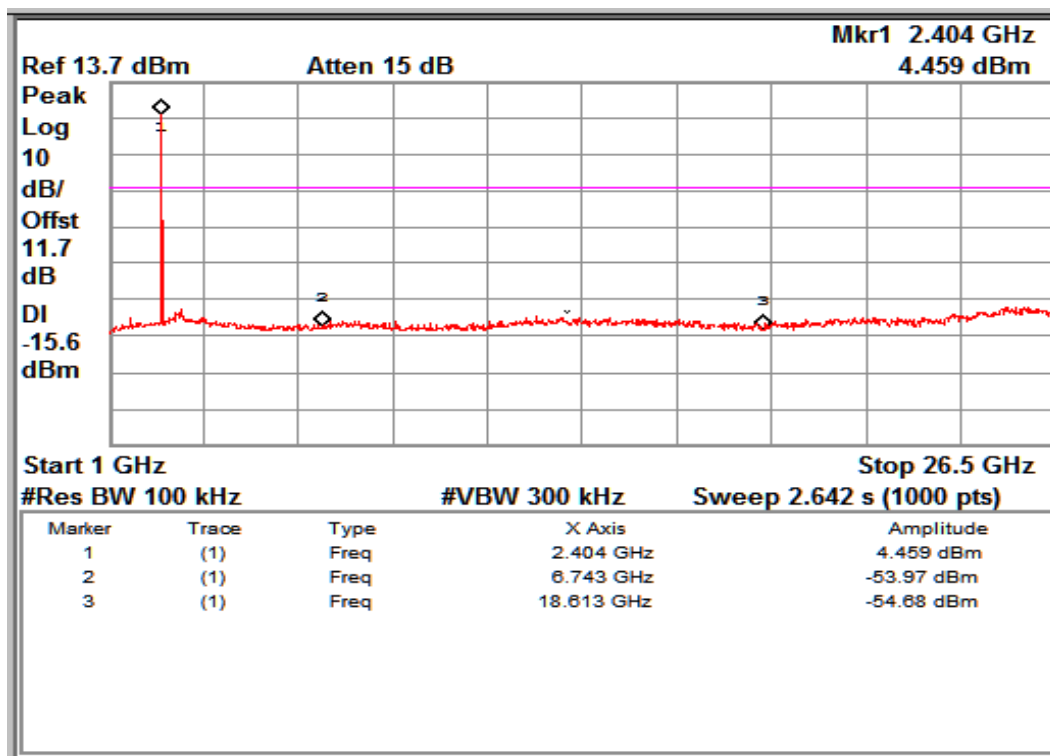
ULR-TC568822300000046F

Seite 30 von 51
Page 30 of 51



Channel Frequency 2402MHz

Frequency Range 30MHz – 1GHz



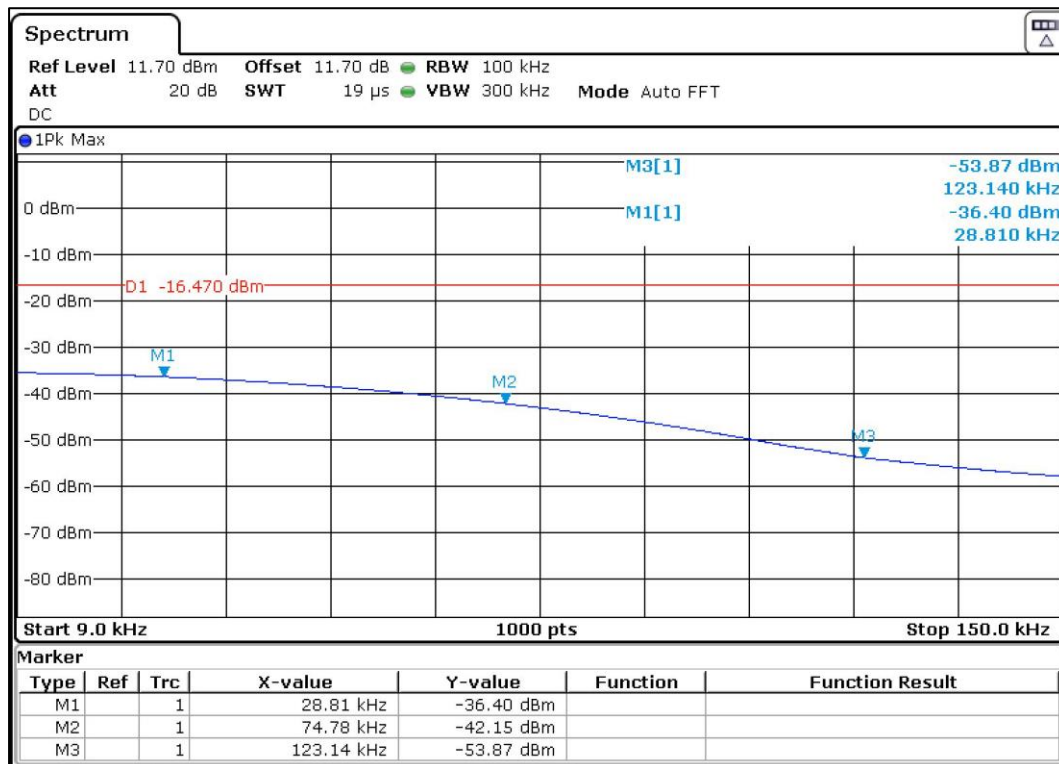
Channel Frequency 2402MHz

Frequency Range 1GHz – 26GHz

Prüfbericht - Nr.:
Test Report No.:

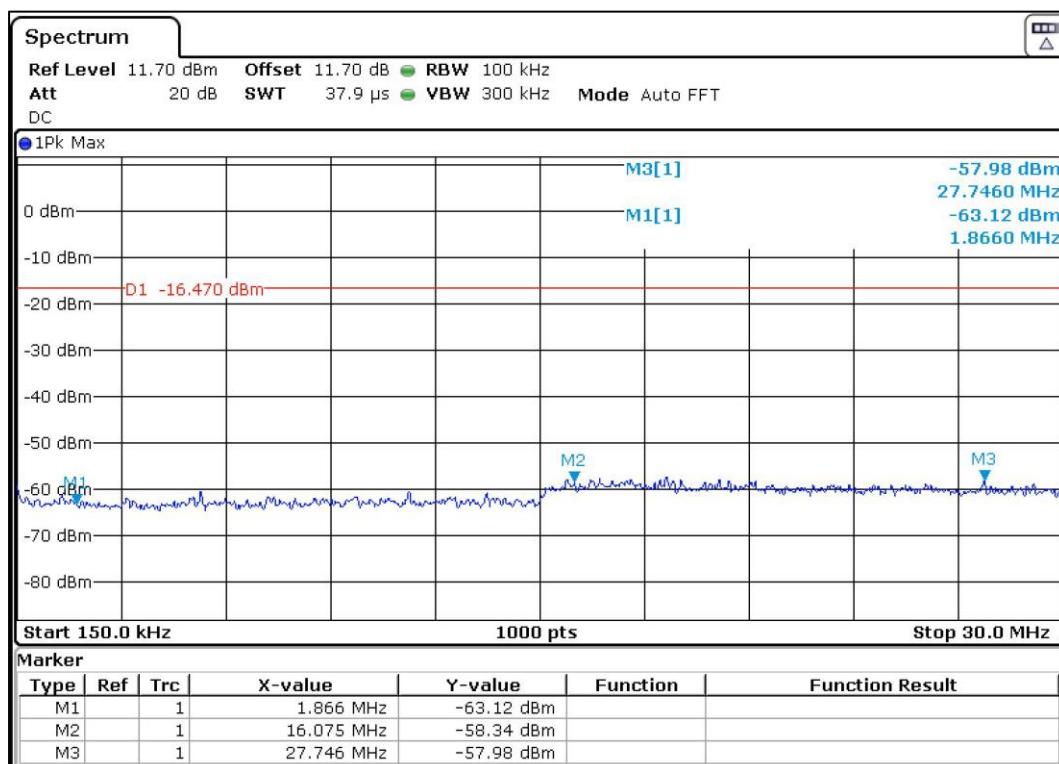
ULR-TC568822300000046F

Seite 31 von 51
Page 31 of 51



Channel Frequency 2440MHz

Frequency Range 9KHz – 150KHz



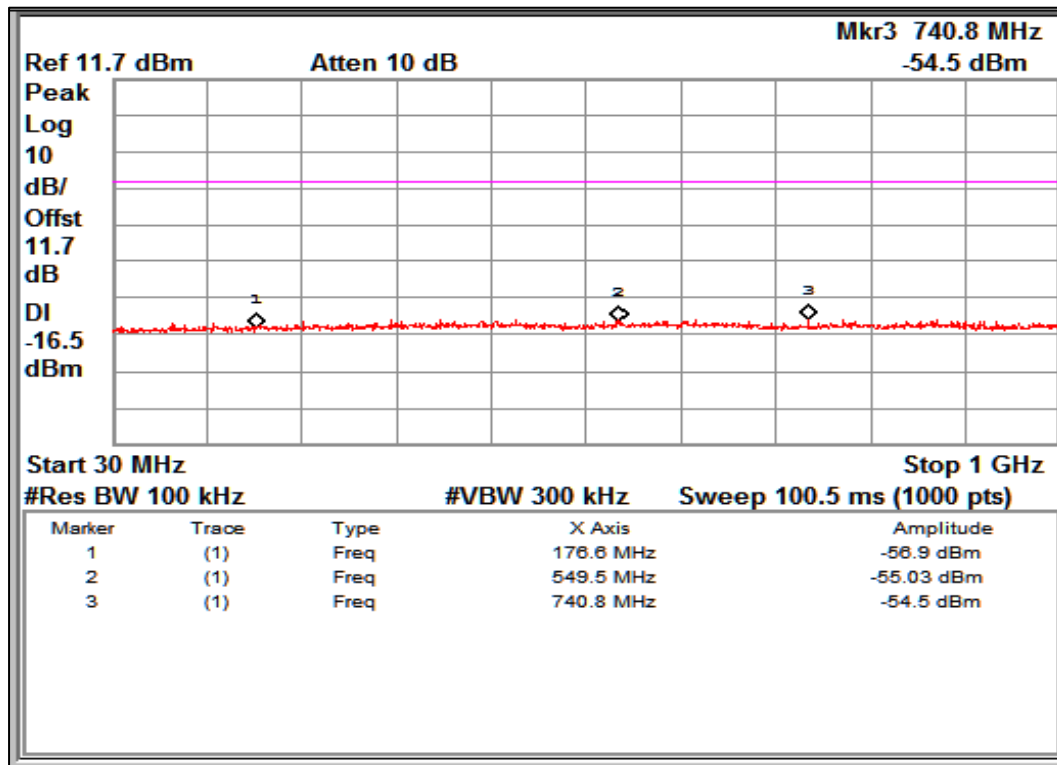
Channel Frequency 2440MHz

Frequency Range 150KHz – 30MHz

Prüfbericht - Nr.:
Test Report No.:

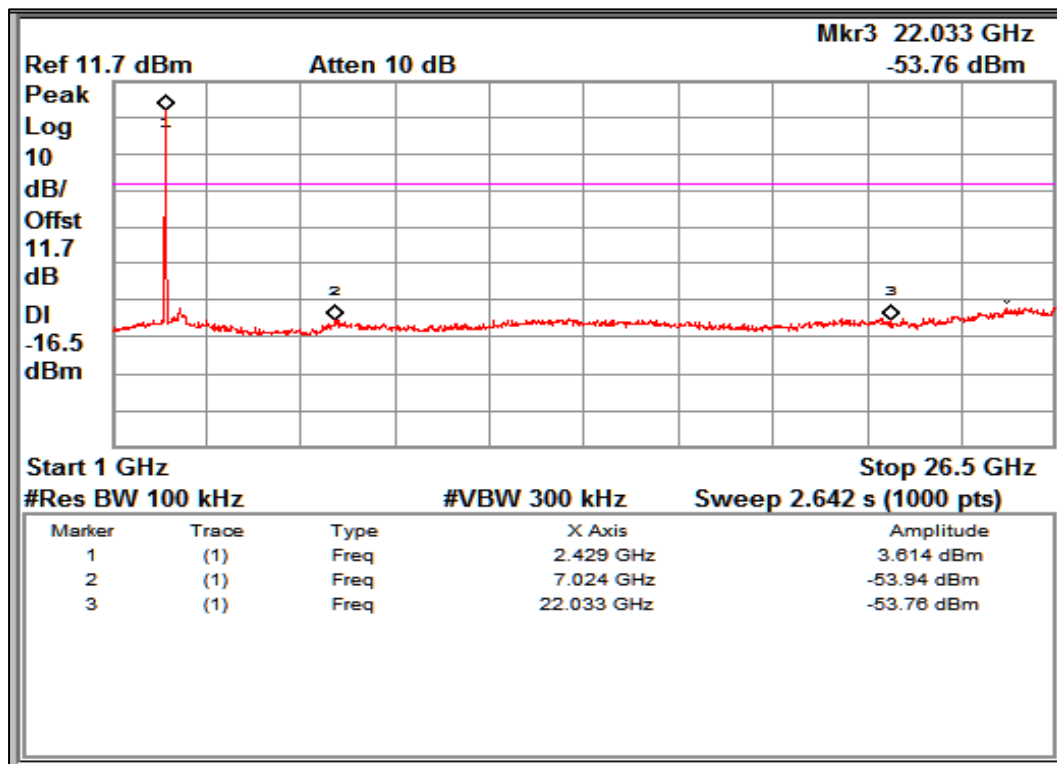
ULR-TC568822300000046F

Seite 32 von 51
Page 32 of 51



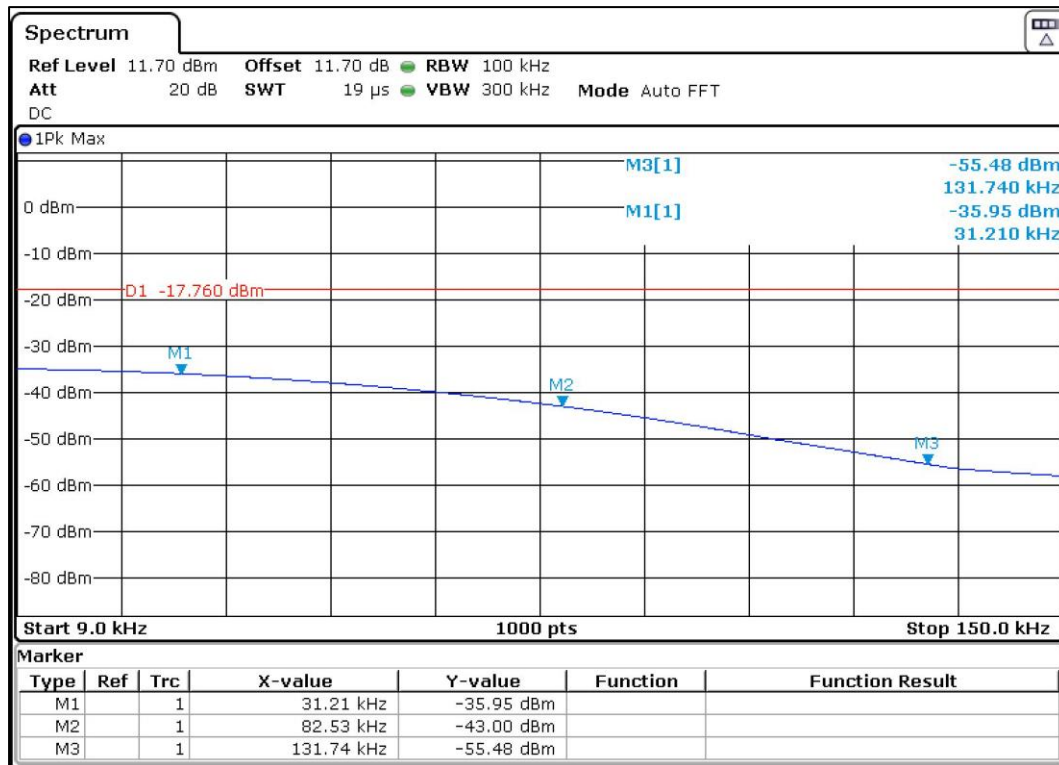
Channel Frequency 2440MHz

Frequency Range 30MHz – 1GHz



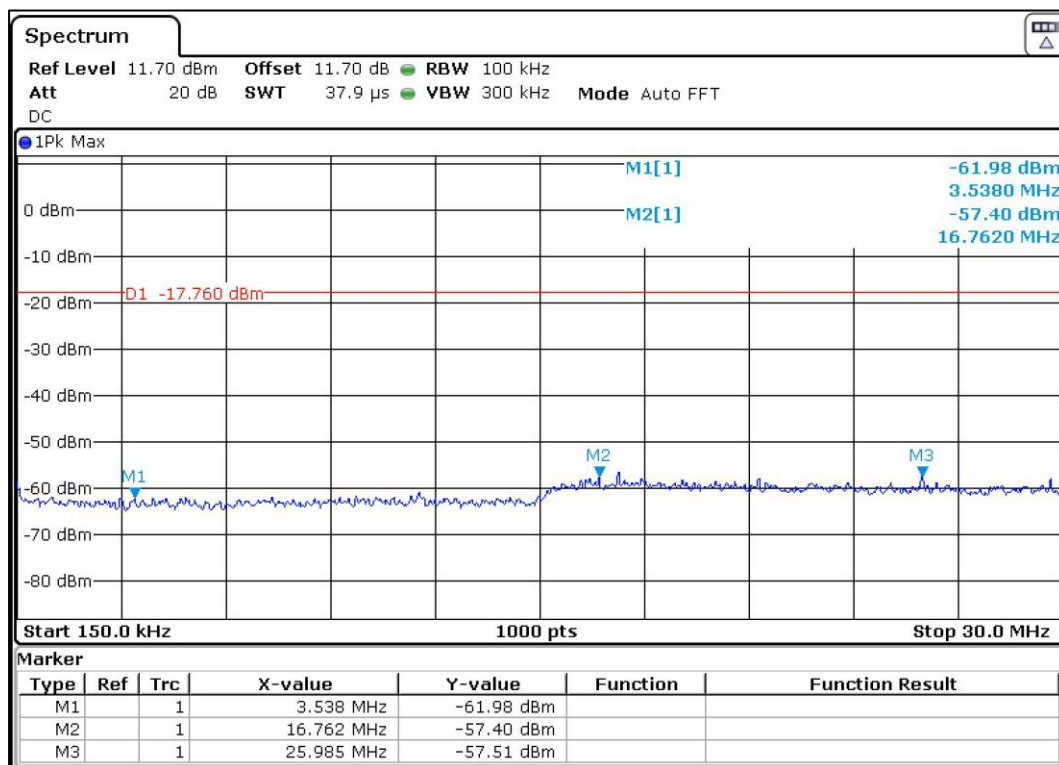
Channel Frequency 2440MHz

Frequency Range 1GHz – 26GHz



Channel Frequency 2480MHz

Frequency Range 9KHz – 150KHz



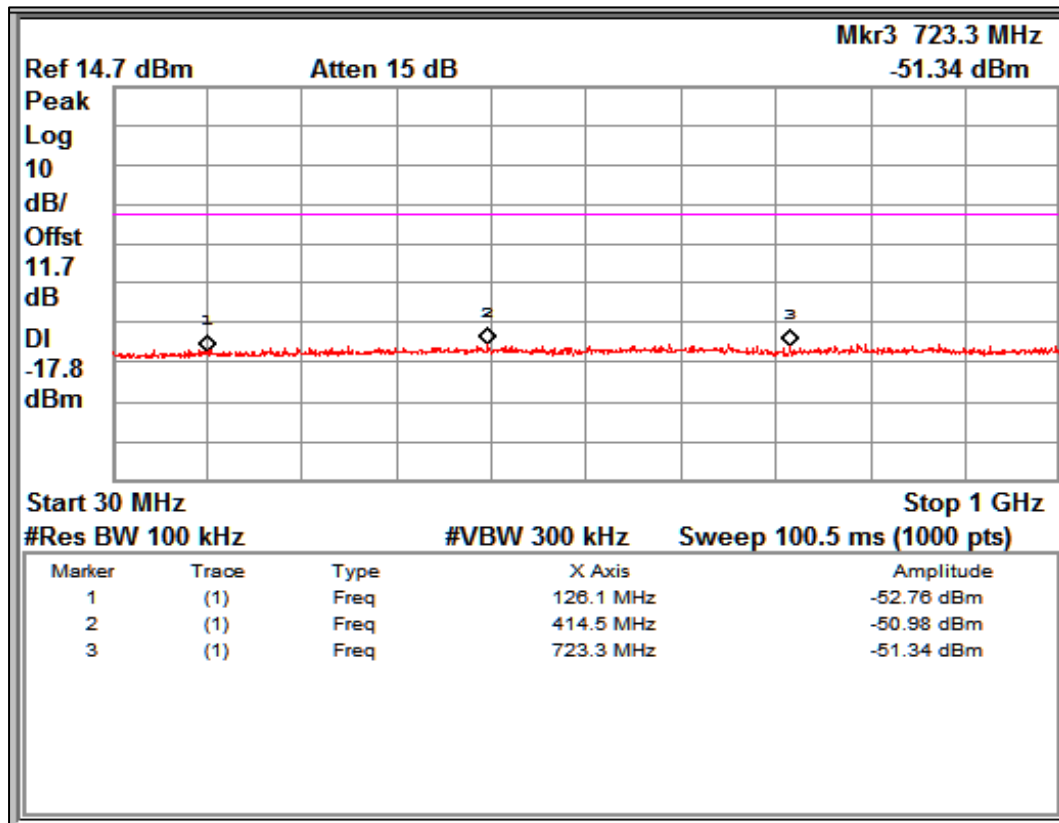
Channel Frequency 2480MHz

Frequency Range 150KHz – 30MHz

Prüfbericht - Nr.:
Test Report No.:

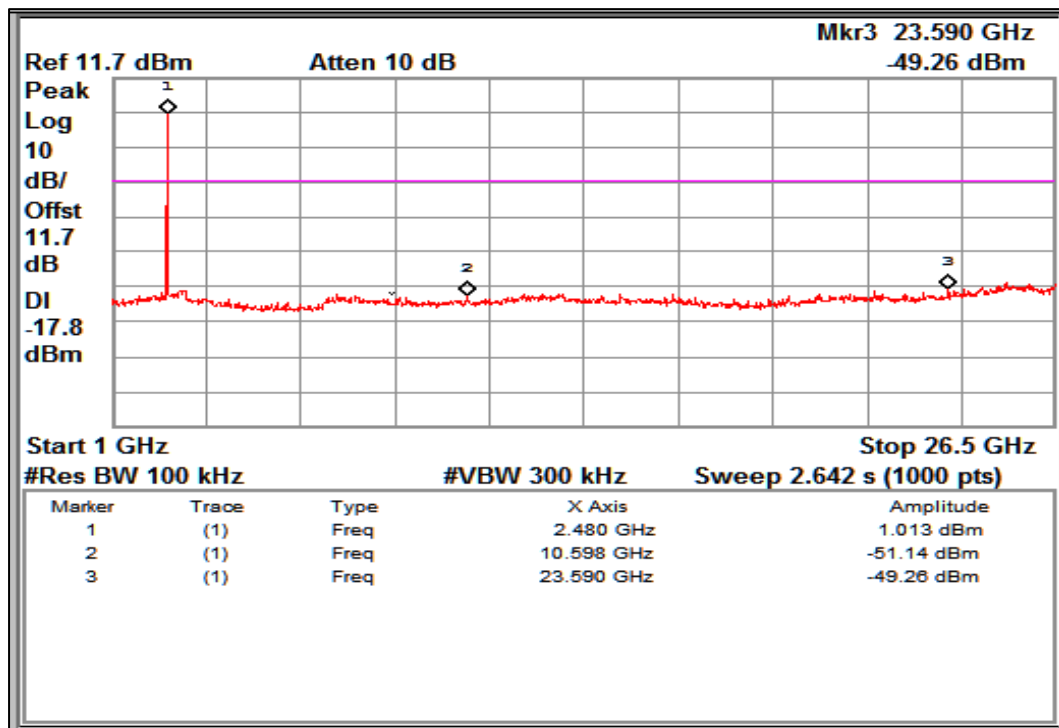
ULR-TC568822300000046F

Seite 34 von 51
Page 34 of 51



Channel Frequency 2480MHz

Frequency Range 30MHz – 1GHz



Channel Frequency 2480MHz

Frequency Range 1GHz – 26GHz

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000046F

Seite 35 von 51
Page 35 of 51

7.5 Spurious Radiated Emissions & Restricted Bands of Operation

Result

Pass

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

Test Conditions:

Temperature (Norm) = + 23.5 °C Voltage = 24V DC Supply Relative humidity: 63%

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000046F

Seite 36 von 51
Page 36 of 51

Test results:

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

Test results for frequency range 9kHz – 30MHz

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

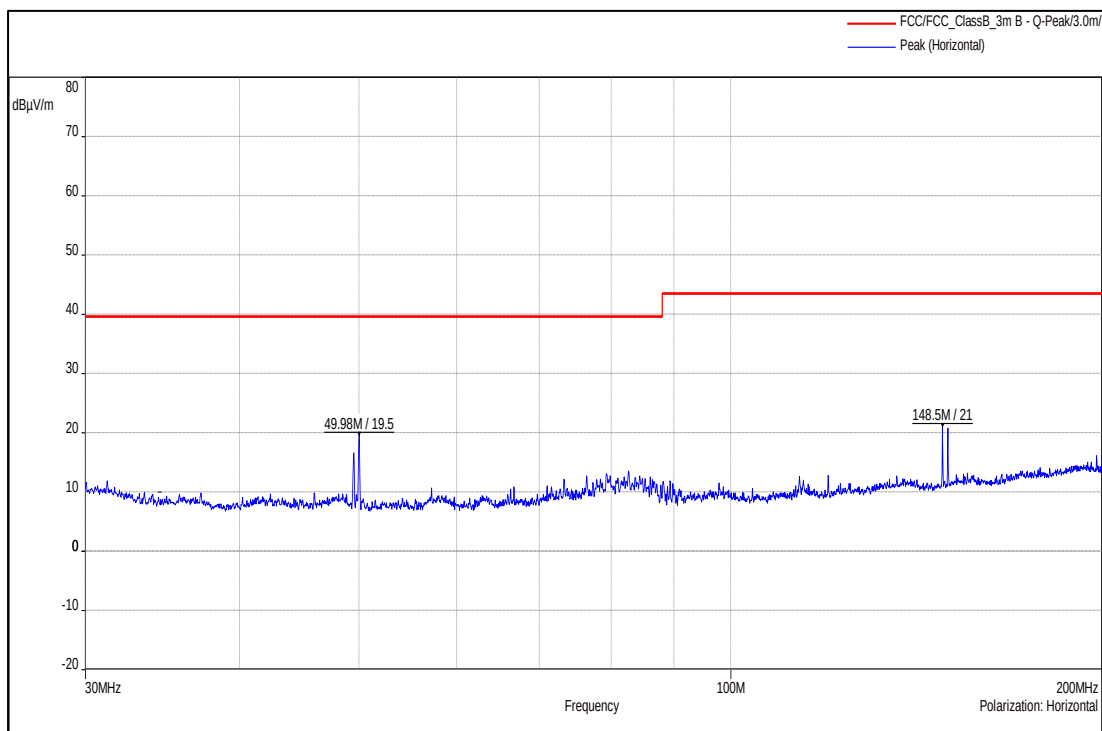
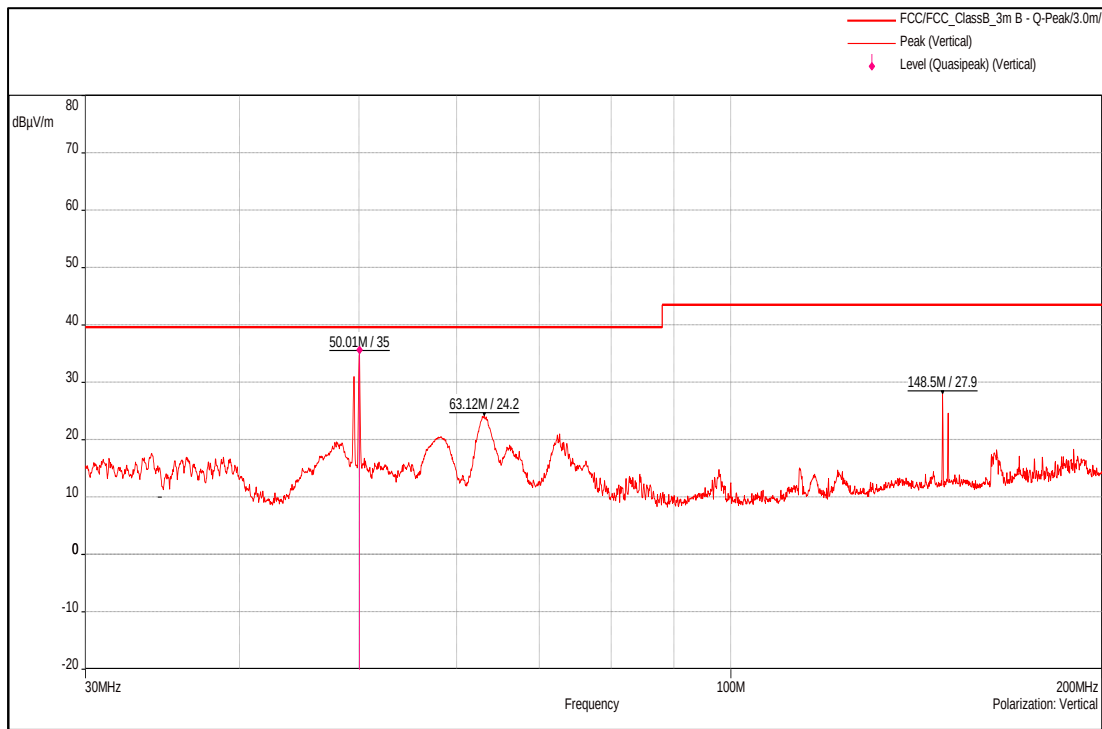
Table 7: Test results for frequency range 30MHz – 1GHz

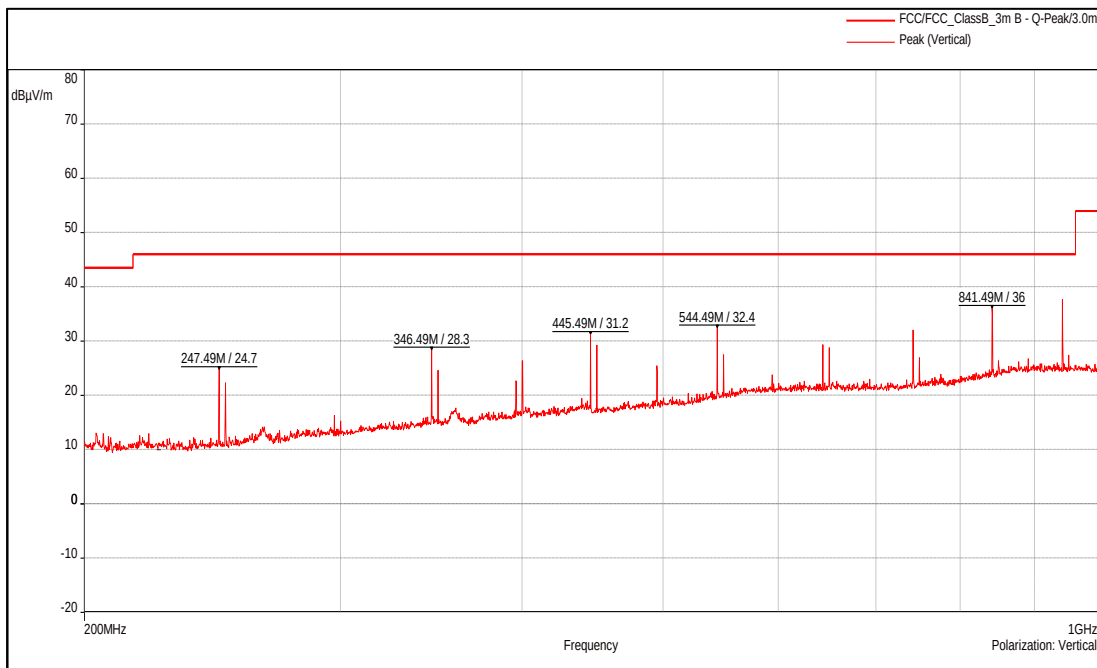
Antenna Polarization	Measured Frequency (MHz)	Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Vertical	50.01	35.00	40	-5.00
	63.12	24.20	40	-15.80
	148.50	27.90	43.5	-15.60
	247.49	24.70	46	-21.30
	246.49	28.30	46	-17.70
	445.49	31.20	46	-14.80
	544.49	32.40	46	-13.60
	841.49	36.00	46	-10.00
Horizontal	49.98	19.50	40	-20.50
	148.50	21.00	43.5	-22.50
	250.01	26.30	46	-19.70
	346.49	33.10	46	-12.90
	445.49	29.40	46	-16.60
	742.49	37.20	46	-8.80

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000046F

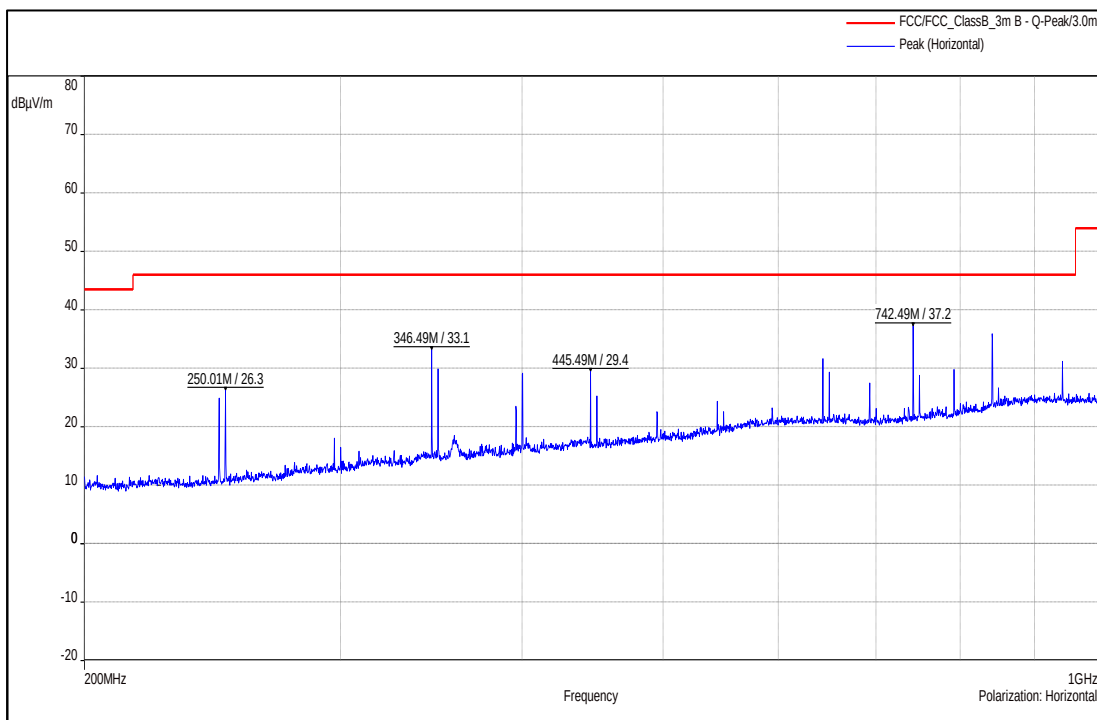
Seite 37 von 51
Page 37 of 51





Channel Frequency 200MHz – 1GHz

Polarization Vertical



Channel Frequency 200MHz – 1GHz

Polarization Horizontal

Prüfbericht - Nr.:
Test Report No.:

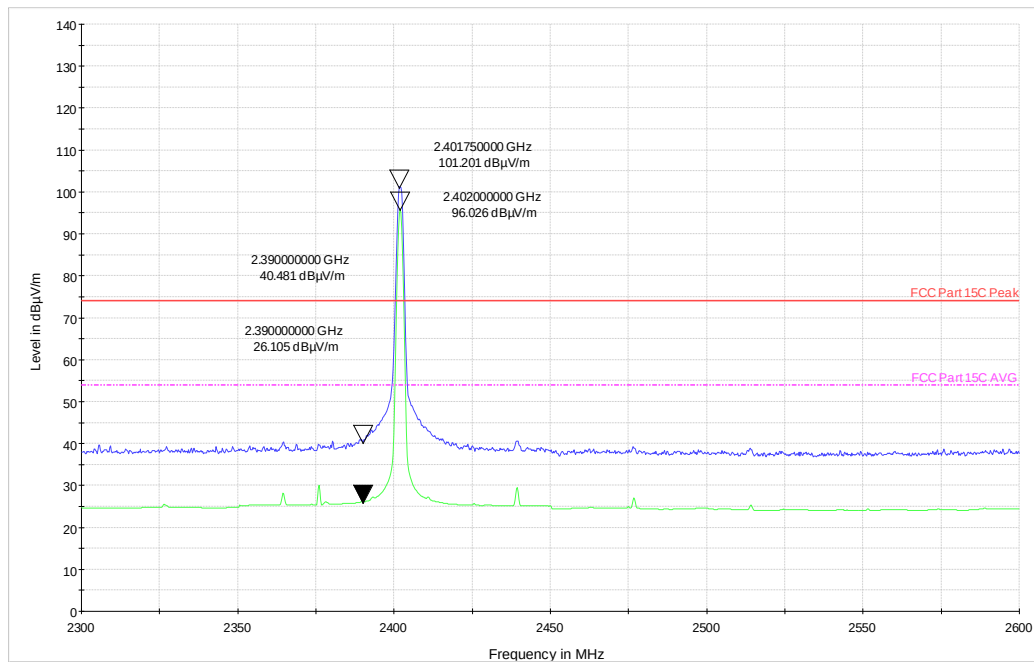
ULR-TC568822300000046F

Seite 39 von 51
Page 39 of 51

Table 8: Test results for the frequencies above 1GHz

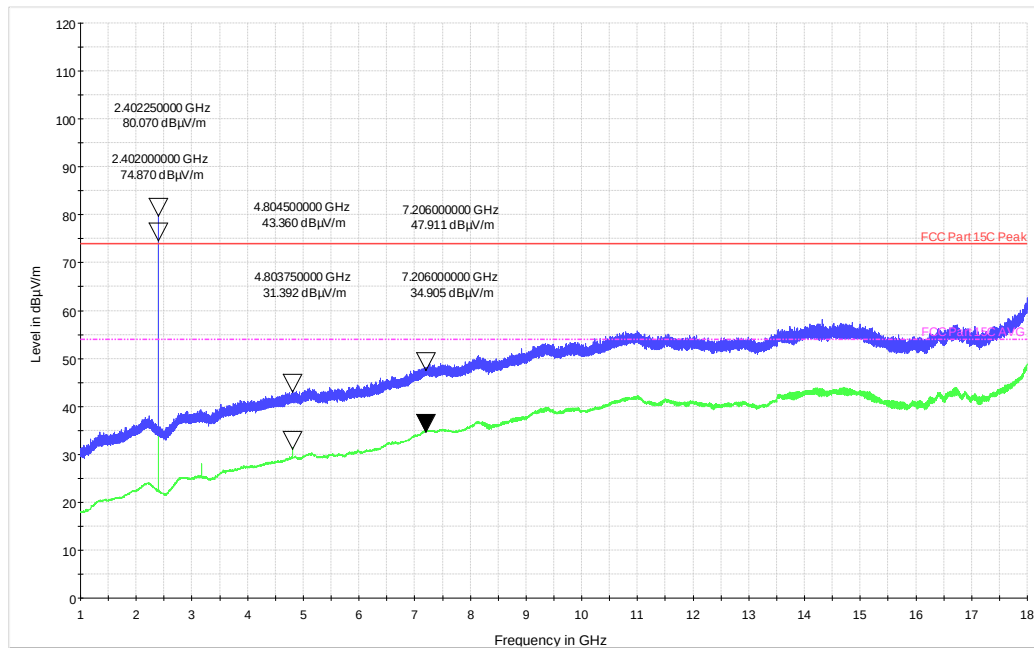
Channel Frequency (MHz)	Frequency (MHz)	Antenna Polarization	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2402	2402(Pk)	Vertical	101.20	*	-
	2402(Av)		96.02	*	-
	2390(Pk)		40.48	74	-33.52
	2390(Av)		26.10	54	-27.90
	4804(Pk)		43.36	74	-30.64
	4804(Av)		31.39	54	-22.61
	7206(Pk)		47.91	74	-26.09
	7206(Av)		34.90	54	-19.10
	2402(Pk)	Horizontal	100.35	*	-
	2402(Av)		95.18	*	-
	2390(Pk)		39.82	74	-34.18
	2390(Av)		25.74	54	-28.26
	4804(Pk)		42.51	74	-31.49
	4804(Av)		30.80	54	-23.20
	7206(Pk)		47.21	74	-26.79
	7206(Av)		34.91	54	-19.09
2442	2442(Pk)	Vertical	100.03	*	-
	2442(Av)		94.84	*	-
	4884(Pk)		41.56	74	-32.44
	4884(Av)		29.17	54	-24.83
	7326(Pk)		46.89	74	-27.11
	7326(Av)		34.80	54	-19.20
	2442(Pk)	Horizontal	99.50	*	-
	2442(Av)		94.33	*	-
	4884(Pk)		40.39	74	-33.61
	4884(Av)		29.12	54	-24.88
	7326(Pk)		46.69	74	-27.31
	7326(Av)		34.86	54	-19.14
2480	2483.5(Pk)	Vertical	46.48	74	-27.52
	2483.5(Av)		30.37	54	-23.63
	2480(Pk)		97.92	*	-
	2480(Av)		92.73	*	-
	4960(Pk)		41.09	74	-32.91
	4960(Av)		29.62	54	-24.38
	7440(Pk)		47.03	74	-26.97
	7440(Av)		34.85	54	-19.15
	2483.5(Pk)	Horizontal	48.19	74	-25.81
	2483.5(Av)		31.61	54	-22.39
	2480(Pk)		99.56	*	-
	2480(Av)		94.38	*	-
	4960(Pk)		41.44	74	-32.56
	4960(Av)		29.77	54	-24.23
	7440(Pk)		46.72	74	-27.28
	7440(Av)		34.87	54	-19.13

Pk: Peak Detector;
Av: Average Detector;



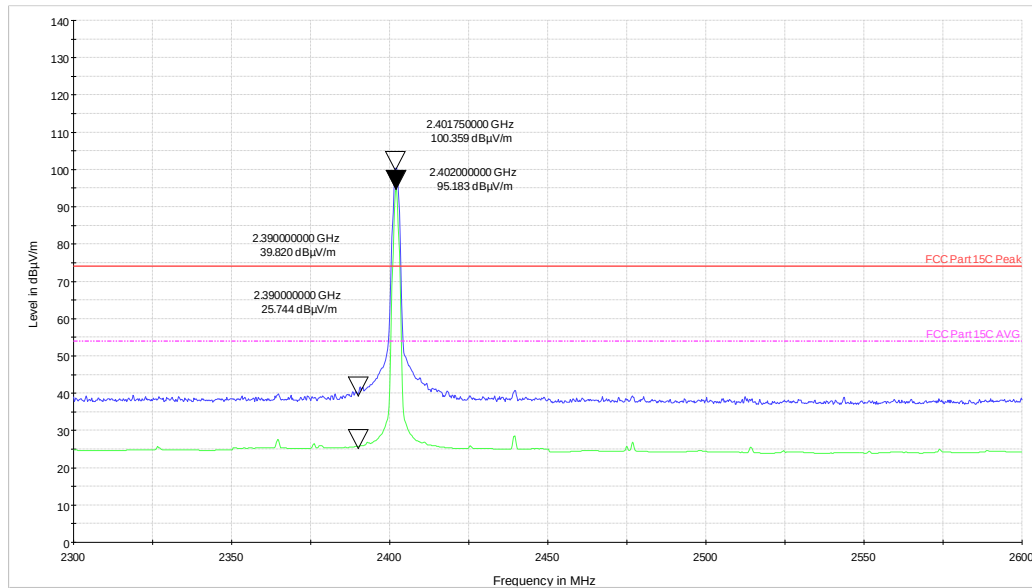
Channel Frequency: 2402MHz

Polarization: Vertical



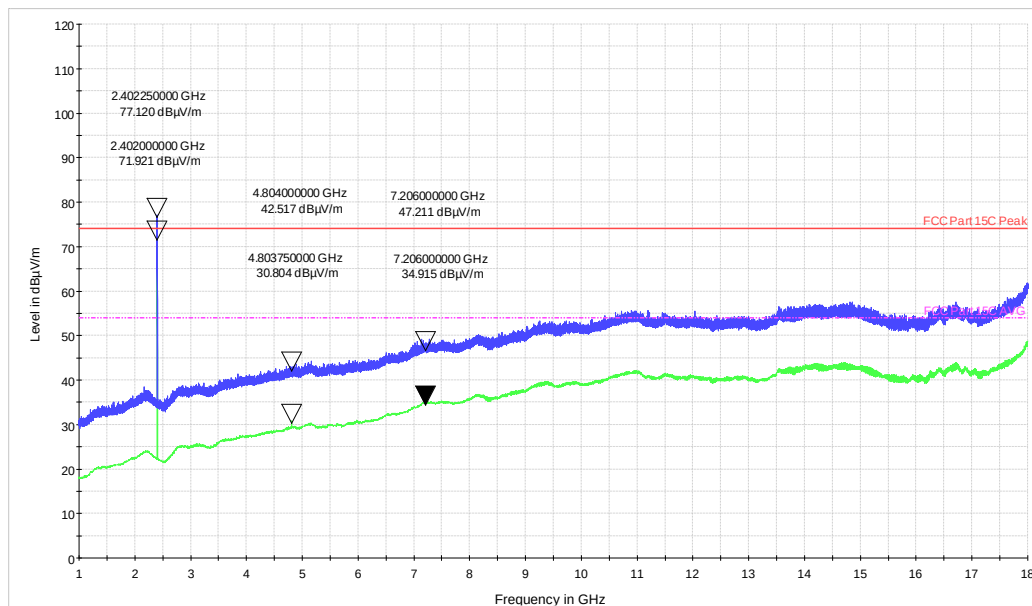
Channel Frequency: 1GHz -18GHz

Polarization: Vertical



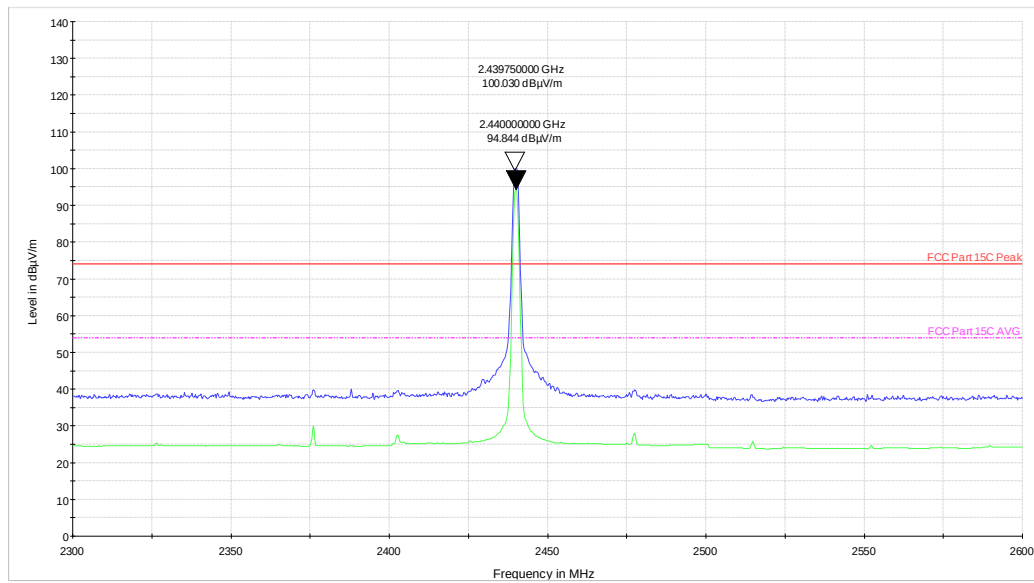
Channel Frequency: 2402MHz

Polarization: Horizontal



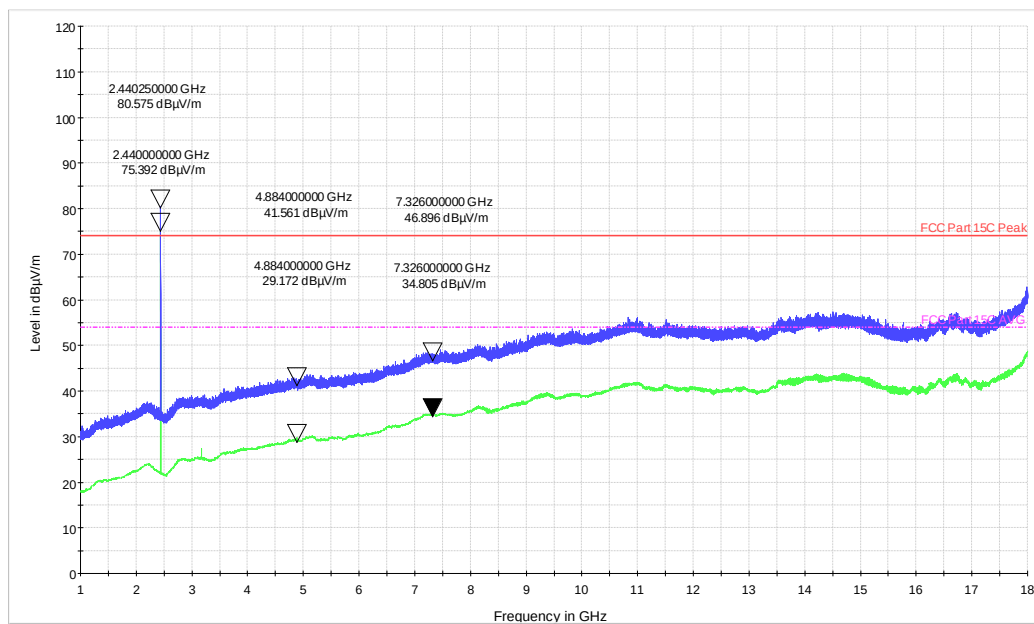
Channel Frequency: 1GHz -18GHz

Polarization: Horizontal



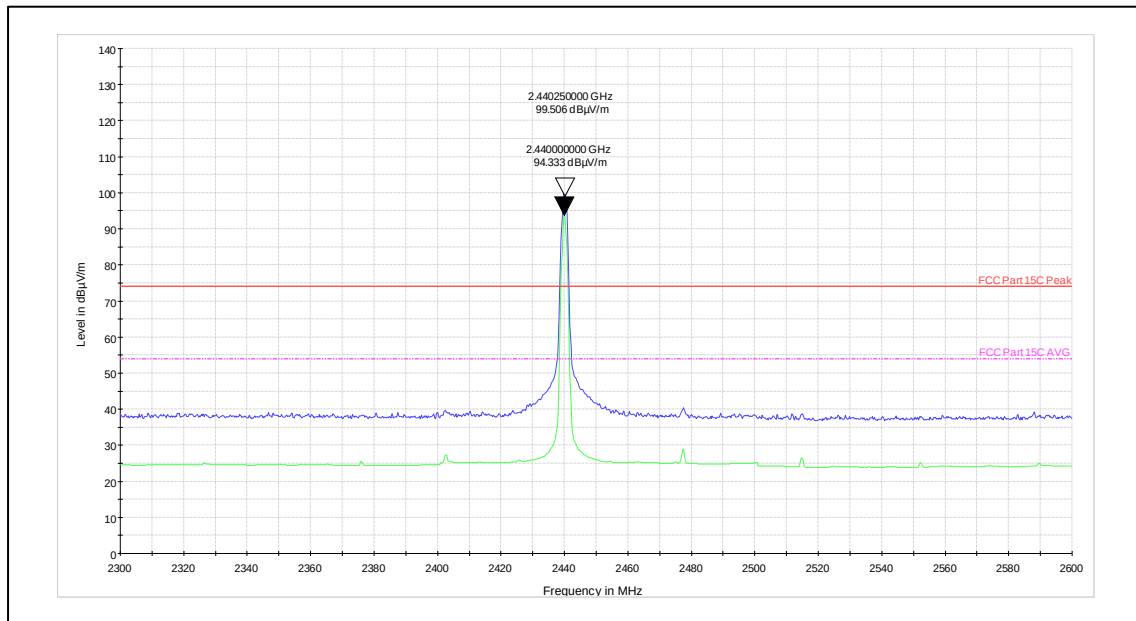
Channel Frequency: 2440MHz

Polarization: vertical



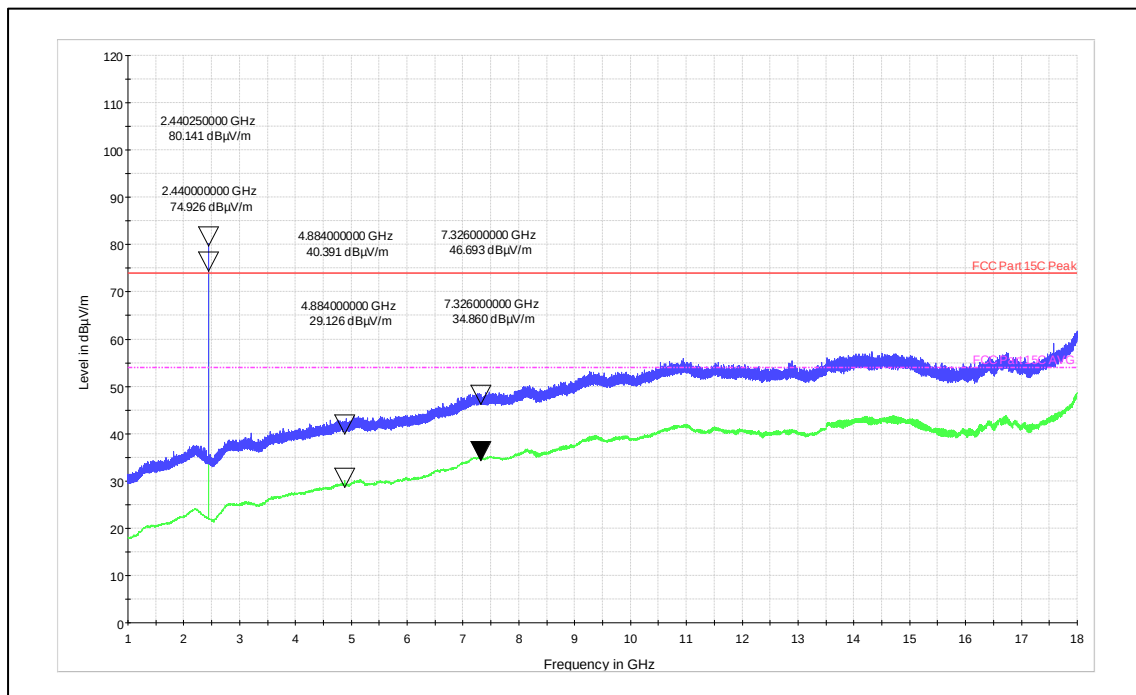
Channel Frequency: 1GHz -18GHz

Polarization: vertical



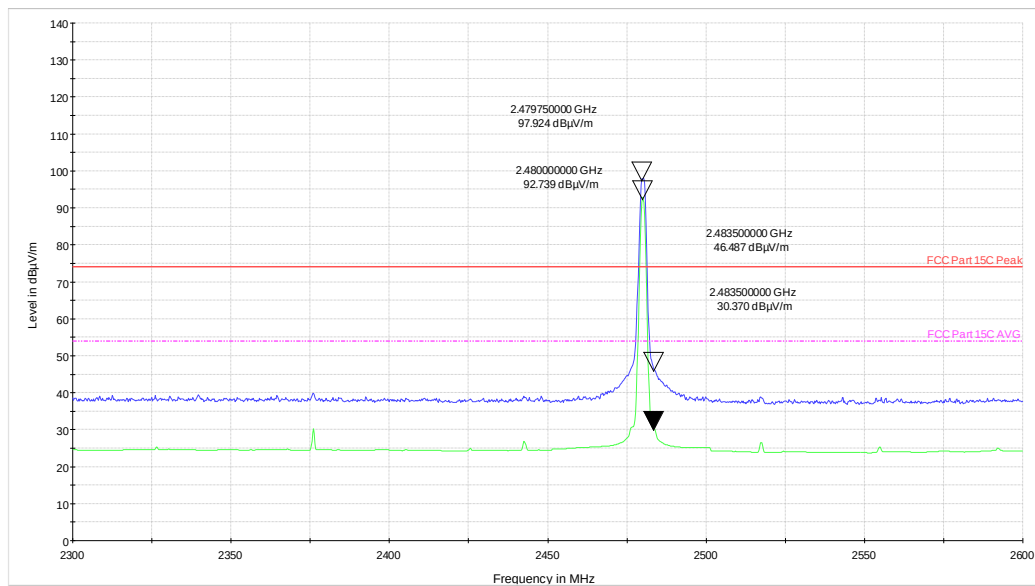
Channel Frequency: 2440MHz

Polarization: Horizontal



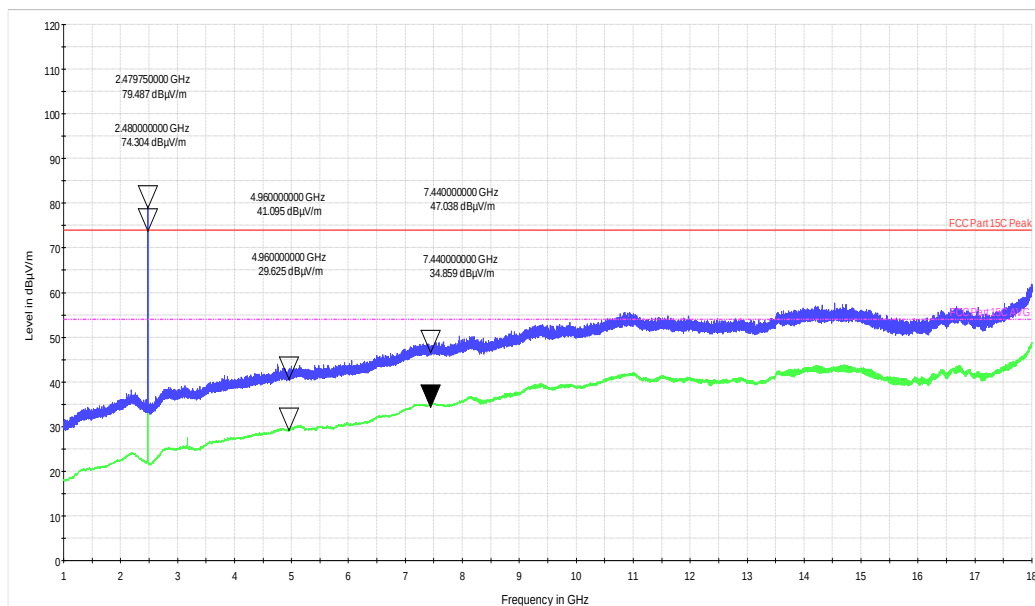
Channel Frequency: 1GHz -18GHz

Polarization: Horizontal



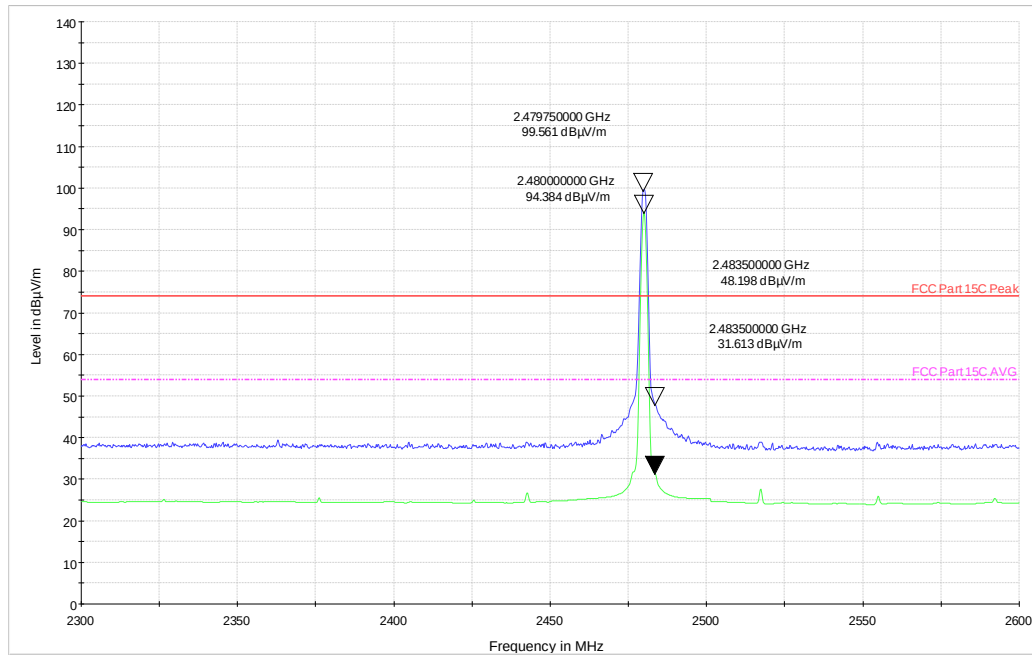
Channel Frequency: 2480MHz

Polarization: vertical



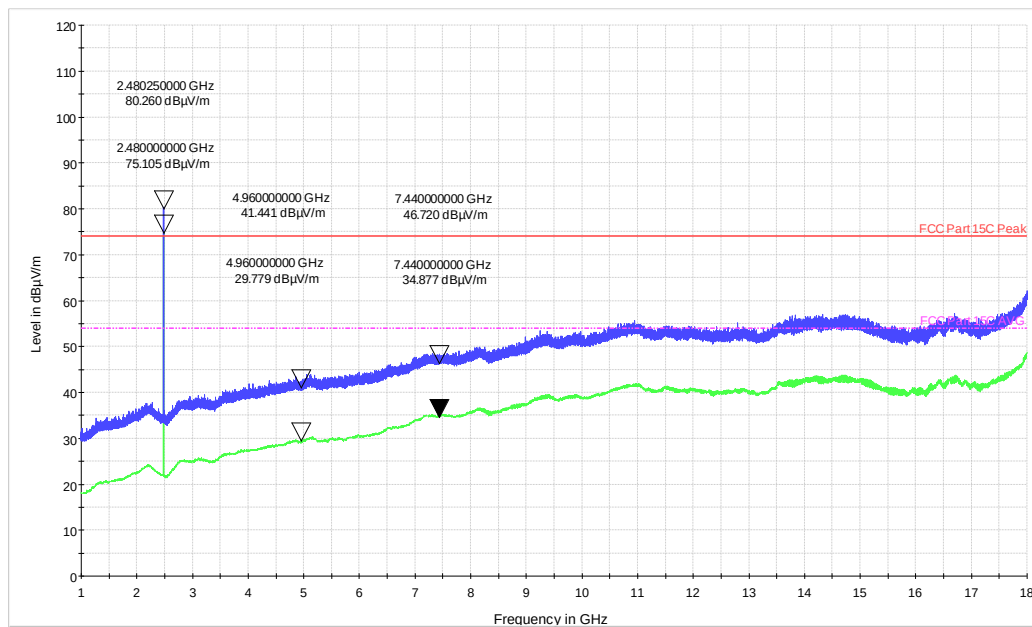
Channel Frequency: 1GHz -18GHz

Polarization: vertical



Channel Frequency: 2480MHz

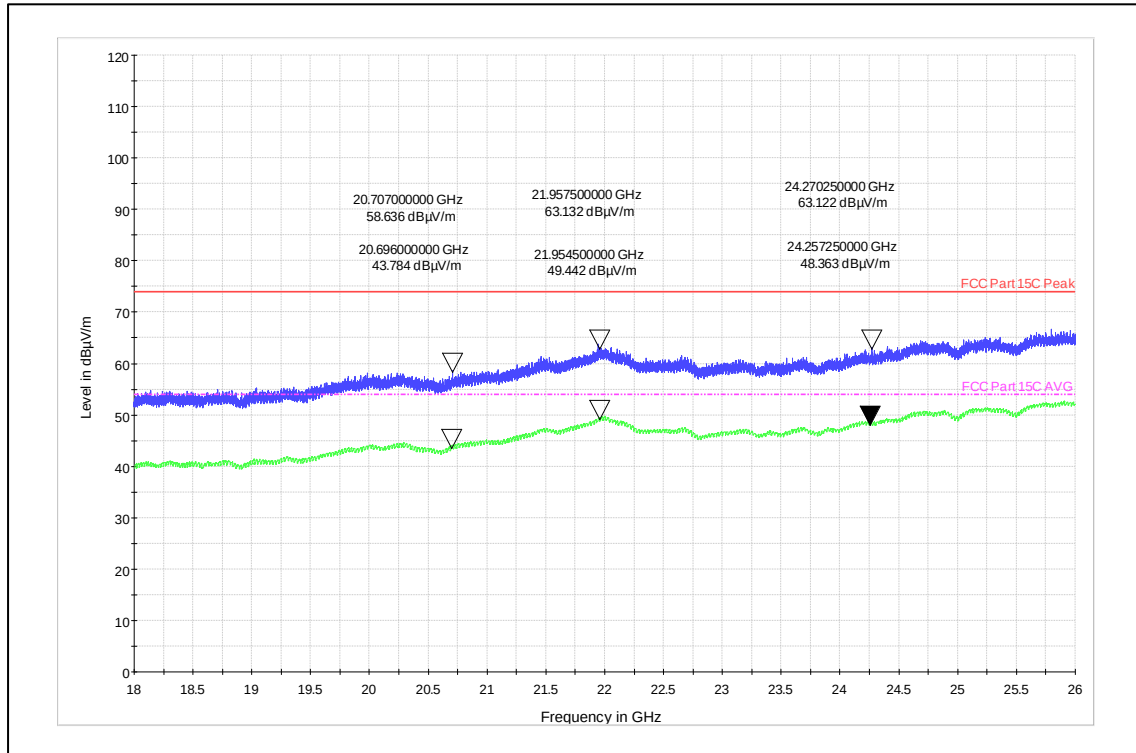
Polarization: Horizontal



Channel Frequency: 1GHz -18GHz

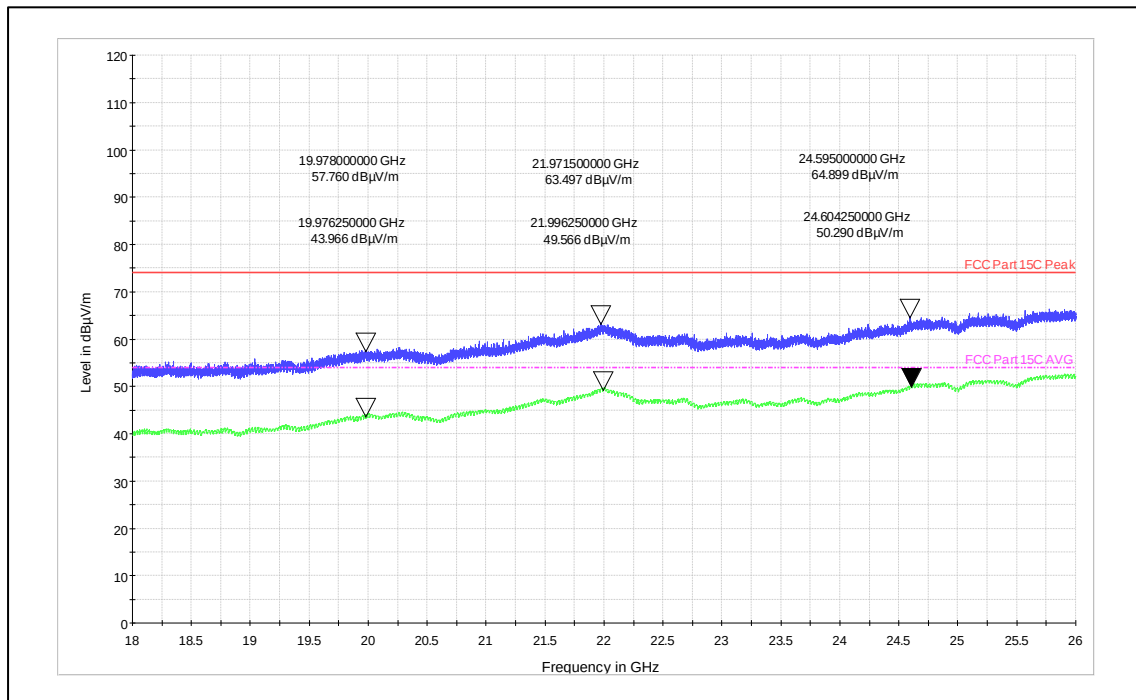
Polarization: Horizontal

Worst case plots:



Channel Frequency: 18GHz -26GHz

Polarization: Vertical



Channel Frequency: 18GHz -26GHz

Polarization: Horizontal

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000046F

Seite 47 von 51
Page 47 of 51

7.6 Conducted spurious emission Test on AC Power lines

Result

Pass

Test Specification : FCC Part 15 Section 15.207 / RSS Gen Issue 5 Section 8.8
Test Method : ANSI C 63.10-2013
Testing Location : Screened room
Measurement Bandwidth : 9kHz
Frequency Range : 150kHz – 30MHz
Supply Voltage : 110VAC,60Hz
Test Method : Refer TEST METHODOLOGY

Table 9: Limits for Conducted poweline emission

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

* Decreases with the logarithm of the frequency

Test Conditions:

Temperature (Norm) = +23.1 °C Voltage = 24V DC Supply Relative humidity: 66%

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000046F

Seite 48 von 51
Page 48 of 51

Test results:

110VAC-60Hz-Line

Result table

Quasipeak:-

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Pos	Measuring time	RBW	Meas.Time	Comments	Correction (dB)
0.21845	36.77	62.89	-26.12	Phase 1	1	9k	0.02	Pass	19.56
22.0266	33.24	60	-26.76	Phase 1	1	9k	0.02	Pass	19.86
0.32865	29.82	59.45	-29.63	Phase 1	1	9k	0.02	Pass	19.57
0.4362	24.4	57.1	-32.7	Phase 1	1	9k	0.02	Pass	19.6
7.1203	24.33	60	-35.67	Phase 1	1	9k	0.02	Pass	19.75
0.874	14.96	56	-41.04	Phase 1	1	9k	0.02	Pass	19.68
2.1963	13.85	56	-42.15	Phase 1	1	9k	0.02	Pass	19.69
0.15135	20.59	66	-45.41	Phase 1	1	9k	0.02	Pass	19.57

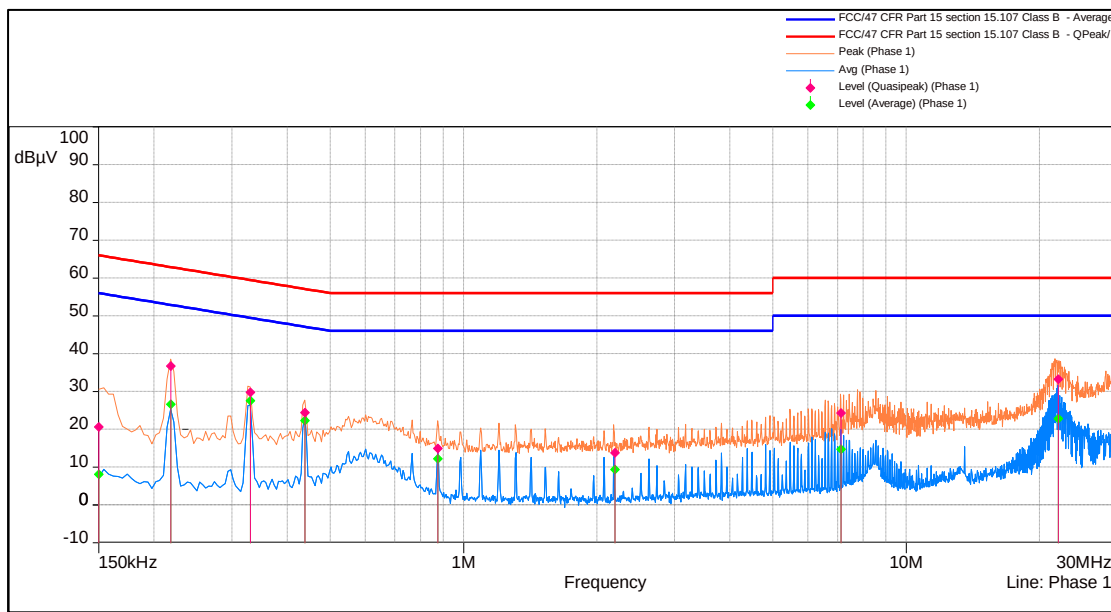
Average:-

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Pos	Measuring time	RBW	Meas.Time	Comments	Correction (dB)
0.32865	27.59	49.45	-21.87	Phase 1	1	9k	0.02	Pass	19.57
0.4362	22.31	47.1	-24.79	Phase 1	1	9k	0.02	Pass	19.6
0.21845	26.62	52.89	-26.28	Phase 1	1	9k	0.02	Pass	19.56
22.0266	22.85	50	-27.15	Phase 1	1	9k	0.02	Pass	19.86
0.874	12.23	46	-33.77	Phase 1	1	9k	0.02	Pass	19.68
7.1203	14.74	50	-35.26	Phase 1	1	9k	0.02	Pass	19.75
2.1963	9.33	46	-36.67	Phase 1	1	9k	0.02	Pass	19.69
0.15135	8.12	56	-47.88	Phase 1	1	9k	0.02	Pass	19.57

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000046F

Seite 49 von 51
Page 49 of 51



Line Graph

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000046F

Seite 50 von 51
Page 50 of 51

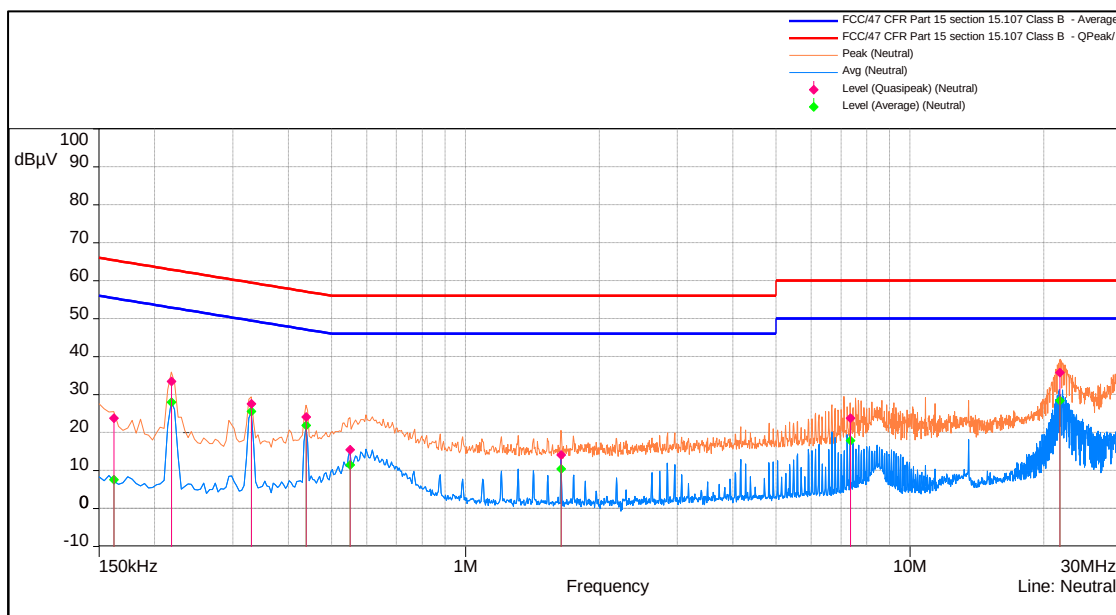
110VAC-60Hz-Neutral:

Quasipeak:-

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Pos	Measuring time	RBW	Meas.Time	Comments	Correction (dB)
21.71605	35.75	60	-24.25	Neutral	1	9k	0.02	Pass	19.88
0.218	33.5	62.89	-29.39	Neutral	1	9k	0.02	Pass	19.55
0.32955	27.56	59.45	-31.89	Neutral	1	9k	0.02	Pass	19.57
0.43845	24.07	57.1	-33.03	Neutral	1	9k	0.02	Pass	19.61
7.34385	23.81	60	-36.19	Neutral	1	9k	0.02	Pass	19.75
0.54865	15.51	56	-40.49	Neutral	1	9k	0.02	Pass	19.64
0.1626	23.81	65.36	-41.55	Neutral	1	9k	0.02	Pass	19.55
1.64335	14.13	56	-41.87	Neutral	1	9k	0.02	Pass	19.69

Average:-

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Pos	Measuring time	RBW	Meas.Time	Comments	Correction (dB)
21.71605	28.44	50	-21.56	Neutral	1	9k	0.02	Pass	19.88
0.32955	25.62	49.45	-23.83	Neutral	1	9k	0.02	Pass	19.57
0.218	27.97	52.89	-24.92	Neutral	1	9k	0.02	Pass	19.55
0.43845	21.86	47.1	-25.24	Neutral	1	9k	0.02	Pass	19.61
7.34385	17.89	50	-32.11	Neutral	1	9k	0.02	Pass	19.75
0.54865	11.52	46	-34.48	Neutral	1	9k	0.02	Pass	19.64
1.64335	10.4	46	-35.6	Neutral	1	9k	0.02	Pass	19.69
0.1626	7.56	55.36	-47.8	Neutral	1	9k	0.02	Pass	19.55



Netural Graph

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 EUT Center frequencies	10
Table 6: Transmitter limits for Radiated emission	35
Table 7: Test results for frequency range 30MHz – 1GHz	36
Table 8: Test results for the frequencies above 1GHz	39
Table 9: Limits for Conducted poweline emission	47

*****End of Test report*****