

Prüfbericht-Nr.: Test report no.:	ULR- TC568820300000020F	Auftrags-Nr.: Order no.:	166450850 0030	Seite 1 von 48 Page 1 of 48
Kunden-Referenz-Nr.: Client reference no.:	NA	Auftragsdatum: Order date:	2020-10-02	
Auftraggeber: FCC Client:	Honeywell international corp, 1860 W.Rosegarden lane,Phoenix,Arizona,			
Auftraggeber: ISED Client:	Honeywell Technology Solution Lab Devarabisanahalli Village,KR puram Hobli, Bangalore, Karnataka-560103,India			
Prüfgegenstand: Test item:	Smart Radar Flexline			
Bezeichnung / Serien-Nr.: Identification / Serial no.:	990014015/SRFL990			
Auftrags-Inhalt: Order content:	Testing and Issue of FCC test report & FCC grant			
Prüfgrundlage: Test specification:	FCC Part 15 Subpart C 15.247, 15.207 & RSS 247 Issue 2 and RSS Gen Issue 5			
Wareneingangsdatum: Date of sample receipt:	2020-03-22			
Prüfmuster-Nr.: Test sample no.:	A002843732-001			
Prüfzeitraum: Testing period:	2020-05-25 - 2020-06-02			
Ort der Prüfung: Place of testing:	Wireless laboratory, Bangalore			
Prüflaboratorium: Testing laboratory:	TÜV Rheinland (India) Pvt. Ltd. 27/B,2 nd Cross, Electronic City Phase I, Bangalore – 560100, India			
Prüfergebnis*: Test result*:	Pass			
geprüft von: tested by:	genehmigt von: authorized by:			
Datum: Date: 2020-06-10	Ausstellatum: Issue date: 2020-07-23			
Stellung / Position: Srinivasa B R Engineer	Stellung / Position: Mahammadgouse Kaladagi Assistant Manager			
Sonstiges / Other: FCC ID:S5751454941 IC ID:573W-51454941				
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:	Prüfmuster vollständig und unbeschädigt Test item complete and undamaged			
* Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet				
* Legend: 1 = very good 2 = good 3 = satisfactory 4 = sufficient 5 = poor P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested				
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <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>				

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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 Emissions on a.c Power Lines	FCC 15.207	RSS-Gen Issue 5, Section 8.8	Pass

Product Category: Electronics Testing

Test Discipline: EMC Test Facility

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REVISION HISTORY OF THIS REPORT

Report Number	Version	Description	Issue date
ULR-TC568820300000020F	01	Initial issue of report	01-07-2020
ULR-TC568820300000020F	02	Updated as per reviewer comment	23-07-2020

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1 GENERAL REMARKS

1.1 Attachments

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

1. TEST SETUP PHOTOS
2. EUT EXTERNAL PHOTOS
3. EUT INTERNAL PHOTOS
4. FCC LABEL AND LABEL LOCATION
5. BLOCK DIAGRAM
6. SPECIFICATION OF EUT
7. SCHEMATIC DIAGRAM
8. BILL OF MATERIAL
9. USER MANUAL
10. MAXIMUM PERMISSIBLE EXPOSURE INFORMATION

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	Test Facility
EMI Receiver	Rohde & Schwarz	ESU 40	100288	4.43 SP3	11.10.2020	Yearly	Radiated Spurious Emission
Active loop antenna	Frankonia	LAX-10	LAX-10-800	-	15.07.2020	Yearly	
Biconical Antenna	Schwarzbeck	VHBB9124+BBA9106	9124-1208+9106-0525	-	16.01.2021	Yearly	
Log - Periodical Antenna	Schwarzbeck	VUSLP9118 A	VULP9118A-0733	-	17.01.2021	Yearly	
Horn Antenna	Schwarzbeck	BBHA9120 D	9120D-1944	-	17.07.2020	Yearly	
Horn Antenna	Schwarzbeck	BBHA9170	BBHA9170-0904	-	29.01.2021	Yearly	
Semi Anechoic Chamber	Frankonia	-	-	-	-	-	
Fully Anechoic Chamber	Albatross	-	-	-	-	-	Antenna - Port Measurements
Spectrum Analyser	Agilent Technologies	E4407B	US41192772	A.14.06	28.09.2020	Yearly	
EMI Receiver	Rohde & Schwarz	ESW 44	101732	-	10.12.2020	Yearly	AC Power line conducted emission
LISN	Rohde & Schwarz	ENV216	100022	-	05.09.2020	Yearly	
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100811	-	01.08.2020	Yearly	

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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

Tank gauging is essential for the assessment of tank contents, tank inventory control and tank farm management. SmartRadar Flexline (SRFL) tank gauges help in accurate level gauging for refineries, tank terminals and petrochemical industries. Smart Radar maintains its ultra-high performance level on a wide range of applications and various tank conditions. The Enhanced Performance Signal processing enables the radar tank gauge to provide an accurate level reading even in difficult applications.

3.2 Ratings and System Details of Equipment under Test

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

Radio Protocol		IEEE 802.15.4	Radar (out of this scope)
Operating Frequency Range		2405MHz to 2475MHz	9.538 GHz to 10.561 GHz
No. of Channels		16	Please refer the Radar radio FCC ID: LOM990SRFL-2 for the details
Channel Spacing		5MHz	
Maximum Measured Power (conducted)		16.41 dBm	
Modulation		DSSS (O-QPSK)	
Number of antennas		Two	
Antenna Gain		4dBi & 8dBi	
Antenna Type		External Omni-directional antenna	
Supply Voltage to Product		Auto select 65 Vac to 240 Vac (+10% to -15%) 50/60 Hz and/or 24 Vdc to 65 Vdc (+10% to -15%)	
Environmental conditions	Storage	-50 °C to +75 °C (-58 °F to +167 °F) Relative humidity5% to 95%	
	Operating	-40 °C to +65 °C (-40 °F to +149 °F) Relative humidity 5% to 95%	
EUT Dimension(H x W x L) mm		217 x 319 x 379 mm	

***Disclaimer:** The information/data is supplied by the client and the same is considered to arrive at the final value. Any changes made apart from the specified specification, can directly impact on the tests results. Refer the products user manual for more details.

Note: Product Smart Radar FlexLine has multiple protocols. All the supported wireless protocols and their respective test results are issued in separate test reports, refer clause 4.6 Report references

3.3 Measurement Uncertainty:

Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of $k = 2$

Table 4: Measurement Uncertainty

Parameter	Uncertainty
Occupied Channel Bandwidth	$\pm 5 \%$
RF output power, conducted	$\pm 1.5 \text{ dB}$
Power Spectral Density, conducted	$\pm 3 \text{ dB}$
Unwanted Emissions, conducted	$\pm 3 \text{ dB}$
All emissions, radiated	$\pm 6 \text{ dB}$
Temperature	$\pm 3 \text{ }^{\circ}\text{C}$
Supply Voltages	$\pm 3 \%$
Time	$\pm 5 \%$

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

4 TEST SET-UP AND OPERATION MODE

4.1 Principle of Configuration Selection

Transmission was enabled with highest possible duty cycle transmission on low, mid and high channel.

4.2 Test Operation and Test Software

Hardware Version of Smart Radar FlexLine : E315167
Hardware Version of GXRM (HVIN): 51454941-001
HW Version of TII XR: 690603
HW Version of CAN PSX: 690606
HW Version of HCI-GPU: 690602

Software Version of Smart Radar FlexLine
Software name: One Wireless R321
Software Version(FVIN): OW321.1-04.0

4.3 Special Accessories and Auxiliary Equipment

Test laptop with adaptor, serial to USB converter & USB extender cable (1m length) is used for EUT configuration

4.4 Countermeasures to achieve EMC Compliance

None

4.5 List of frequencies

Frequency Band (MHz)	Channel Number	Channel Frequency (MHz)
2400 – 2483.5	01	2405
	02	2410
	03	2415
	04	2420
	05	2425
	06	2430
	07	2435
	08	2440
	09	2445
	10	2450
	11	2455
	12	2460
	13	2465
	14	2470
	15	2475

Table 5: List of IEE 802.15.4 Center frequencies

Channel used for IEE 802.15.4 testing

Channel low : 2405MHz

Channel mid : 2440MHz

Channel High : 2480MHz

Note:

TUV Sample Identification number : A002843732-001 (Radiated & Conducted) test Sample

4.6 Report references

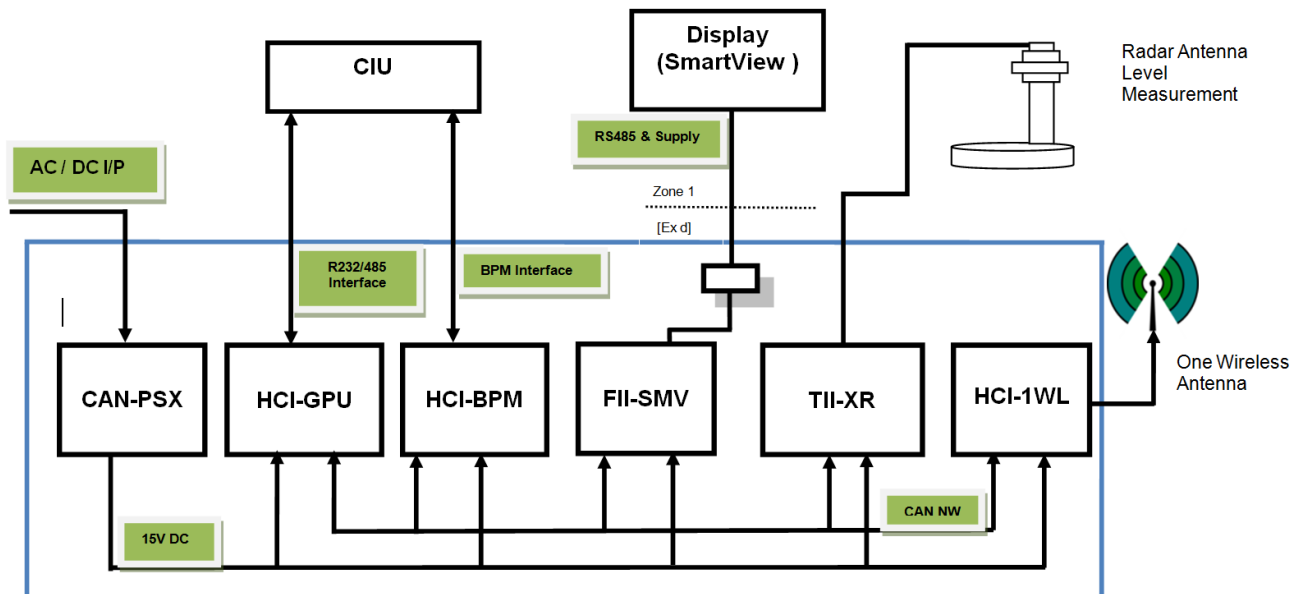
Note: Product Smart Radar Flex line has multiple protocols. All the supported wireless protocols and their respective test results can be found in different FCCID, following table lists the same.

Radio Protocol	FCC ID
RF test report for Radar (9.538 GHz to 10.561 GHz)	LOM990SRFL-2

5 Operational Description

The SmartRadar FlexLine system is built up from interchangeable hardware modules. These modules consist of uniform printed circuit boards (PCBs), each of them representing a different, unique functionality. Together with the software implemented on these hardware parts, each PCB makes up a so-called FlexConn module. These modules communicate with each other via the serial CAN-bus on the DIN rail backplane - on which they are mounted - or wireless by using the OneWireless Network option. HCI-IWL Card accommodate the GXRM radio module.

6 Block Diagram



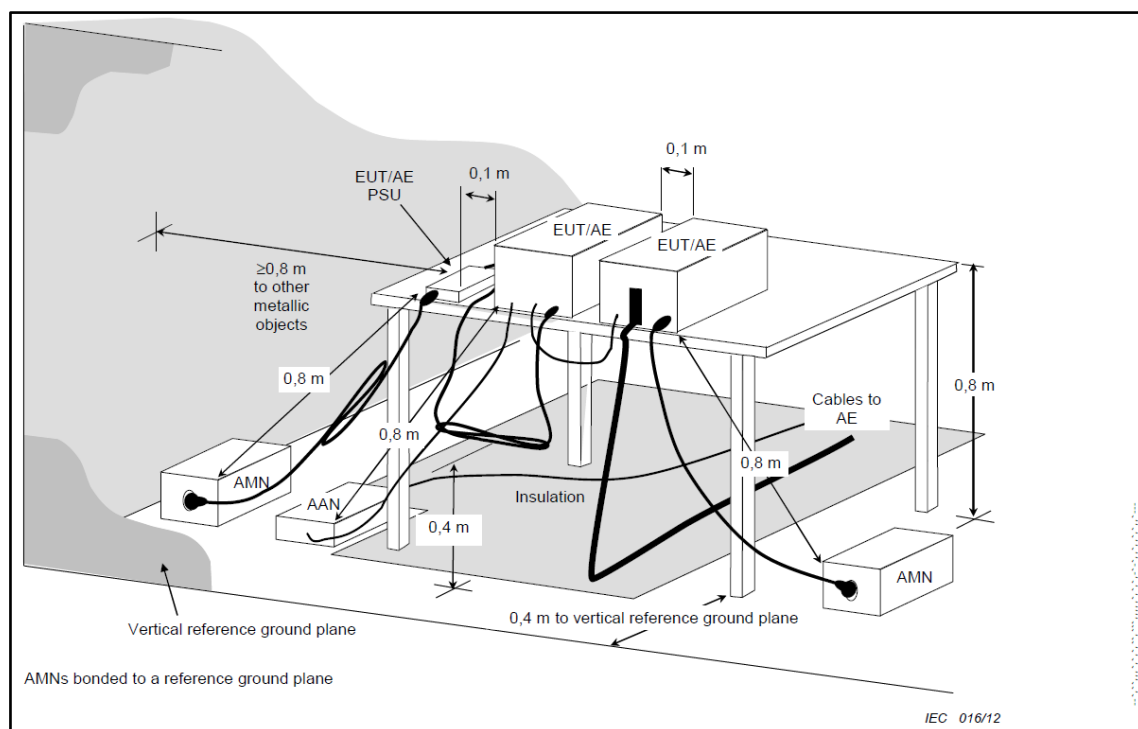
7 TEST METHODOLOGY

7.1 Conducted Spurious Emission Test on AC Power Line

Measured levels of ac power-line conducted emission across the 50Ω LISN port (to which the EUT is connected). All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer.

The device is placed on the test table, raised 80cm above the reference ground plane. The vertical conducting plane is located 40cm to the rear of the device. AC Conducted emission measurement is made over frequency range from 150kHz to 30MHz, this measurement was performed with EUT powered by 2 methods and both method are tested individually, one with an AC adaptor with 110V AC 60Hz supply and second with Wireless charger with supply 110V AC 60Hz.

7.1.1 Test Setup Configuration



7.2 Radiated Emission Test

The radiated emission measurement was performed according to the procedures in ANSI C63.10-2013. The equipment under test (EUT) was placed at the middle of the 80 cm high turntable for below 1 GHz & 1.5 m height for above 1 GHz measurement, and the EUT is 3 meters far from the measuring antenna. The turntable was rotated 360° for obtaining the maximum emission. The height of the measuring antennas was scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Repeat the measurement steps until the maximum emissions were obtained. The measurement above 1000 MHz was performed by horn antenna, The measurement below 30 MHz was performed by loop antenna, Measurement from 30 MHz to 200 MHz was performed by Baloon and Biconical Antenna, and measurement from 200 MHz to 1 GHz was performed by Log-Periodic Antenna.

The EUT was rotated around the X-, Y-, and Z-Axis and the results from worst case axis are recorded

Note: Measured Field strength level (dBμV/m) = Received Emissions(dBμV) + Antenna Factor(dB/m) + Cable Loss(dB) – Pre-amplifier Gain(dBi)

7.2.1 Test Setup Configuration

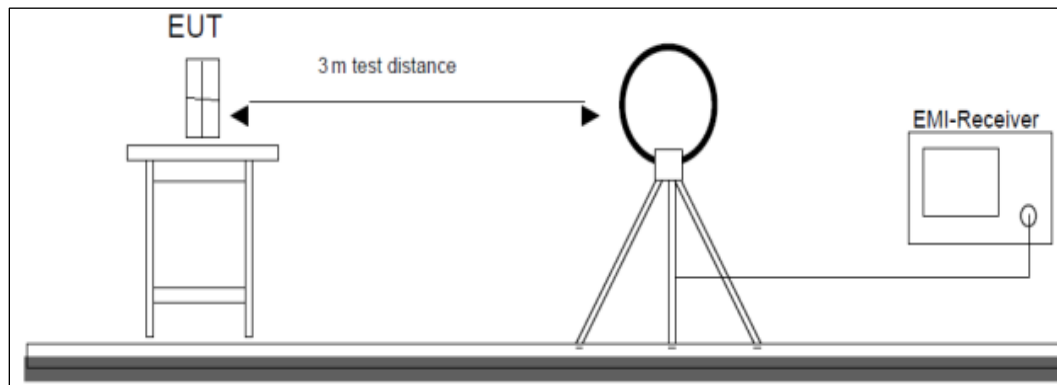


Figure 1: Frequency Range 9 kHz- 30 MHz

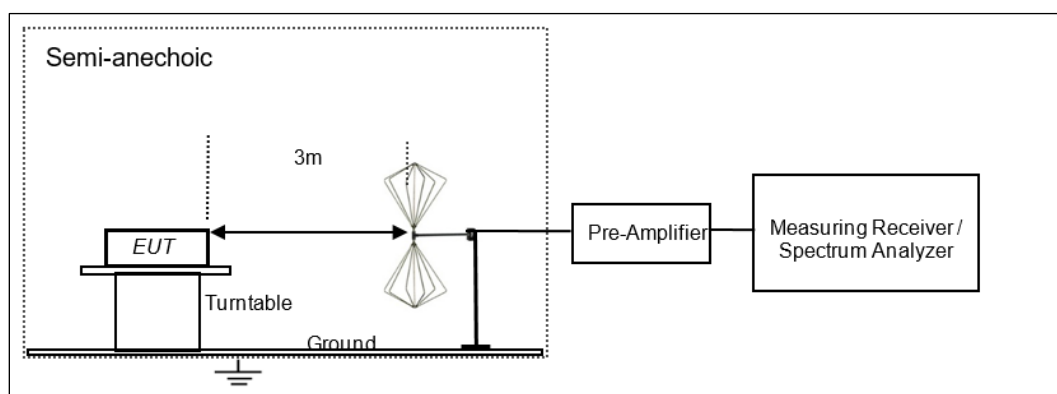


Figure 2: Frequency Range 30 MHz – 200 MHz

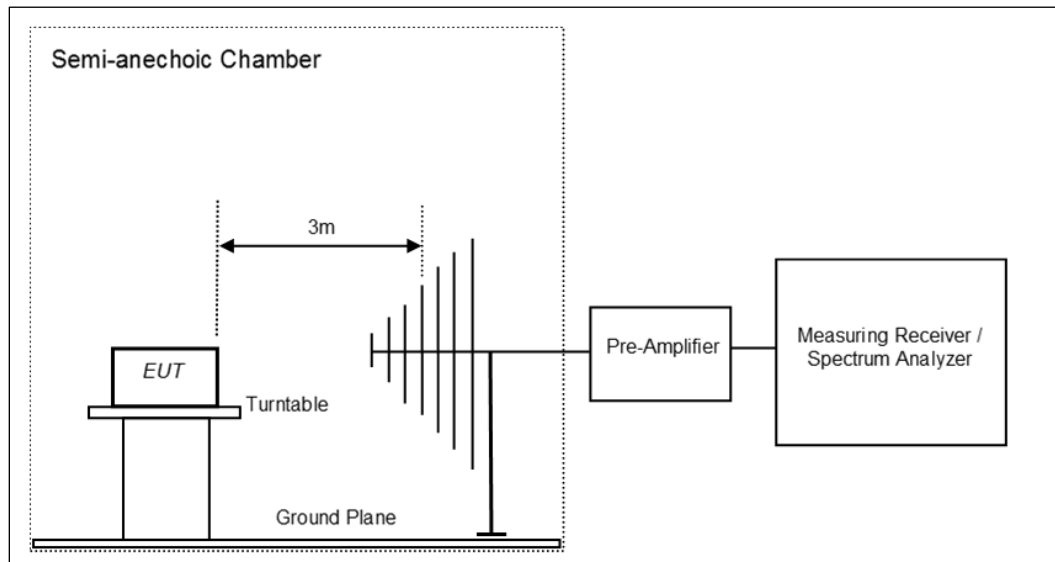


Figure 3: Frequency Range 200 MHz - 1GHz

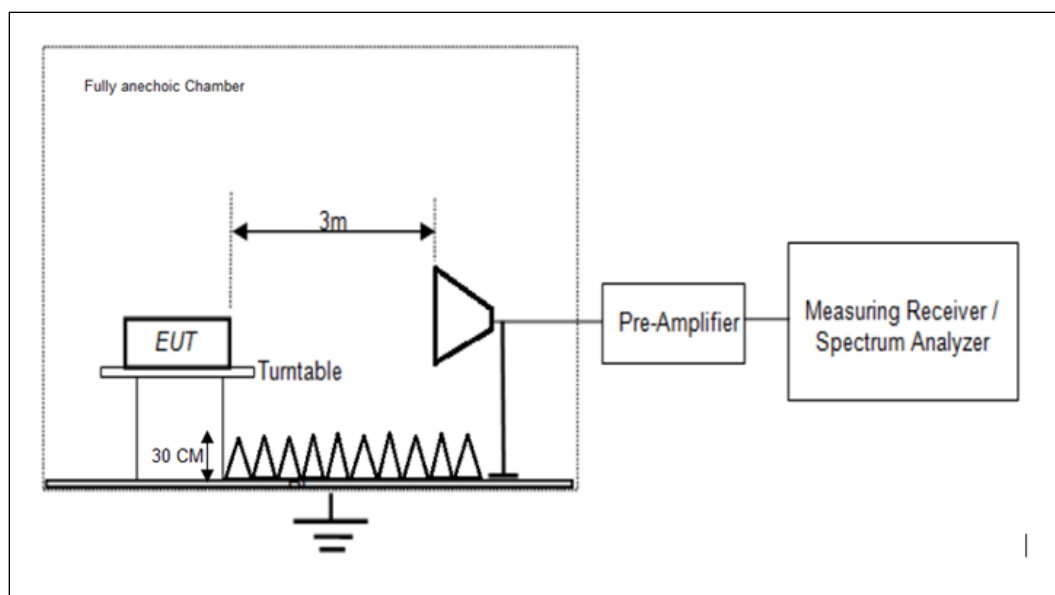


Figure 4: Frequency Range above 1 GHz

8 TEST RESULTS

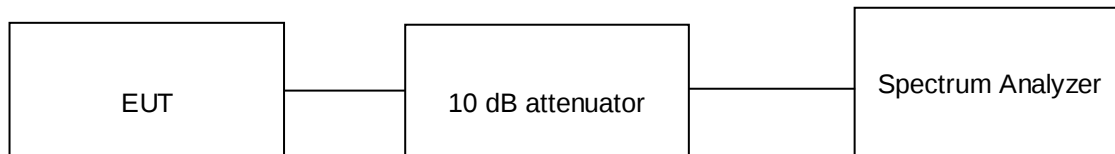
8.1 Maximum Peak Conducted Output Power

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	3MHz
Detector	Peak
Port of testing	Antenna port
Requirement	Power ≤ 1 W (30 dBm) & e.i.r.p ≤ 4 W (36 dBm)

Test Method:



Test Condition

Normal Test Condition:

Temperature (Norm) = + 25 °C

Voltage = 110VAC, 60Hz

Relative humidity: 62%

KDB Guidelines applied:

Measurements were made as per section 8.3.1 in KDB 558074 D01 15.247 Measurement Guidance v05r02.

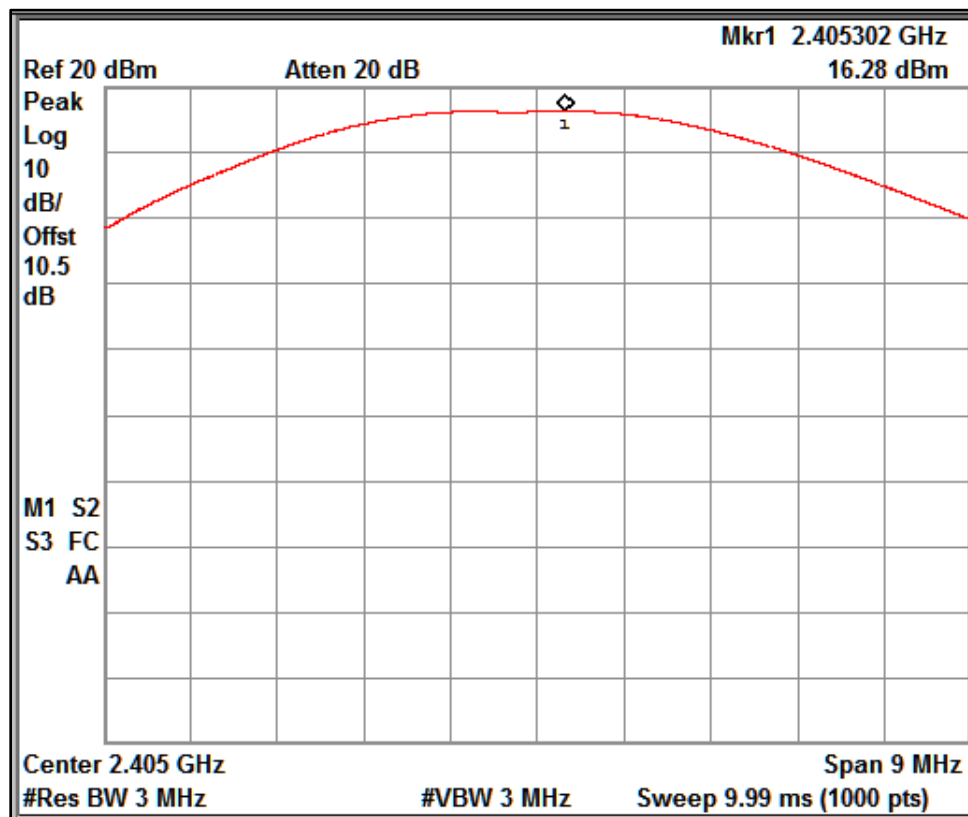
Test results:

Note:

1. All the losses are included during measurement and final values are mentioned in the test report.
2. Total Peak Output power (dBm) = Measured Peak power (dBm) + Attenuator factor (10dB) + Cable loss (0.5dB)
3. This product do not support additional beamforming gain / directional gain, it uses two external Omni antennas with the directional gain of 4dBi and 8dBi
4. Maximum (e.i.r.p) = Maximum Peak output power (dBm) + antenna gain (dBi)

Table 6: Maximum peak conducted power results

Data Rate	Channel Frequency	Maximum e.i.r.p	Limit
(Kbps)	(MHz)	(dBm)	(dBm)
250	2405	24.28	36
	2440	24.41	36
	2475	21.43	36



Channel Frequency: 2405MHz

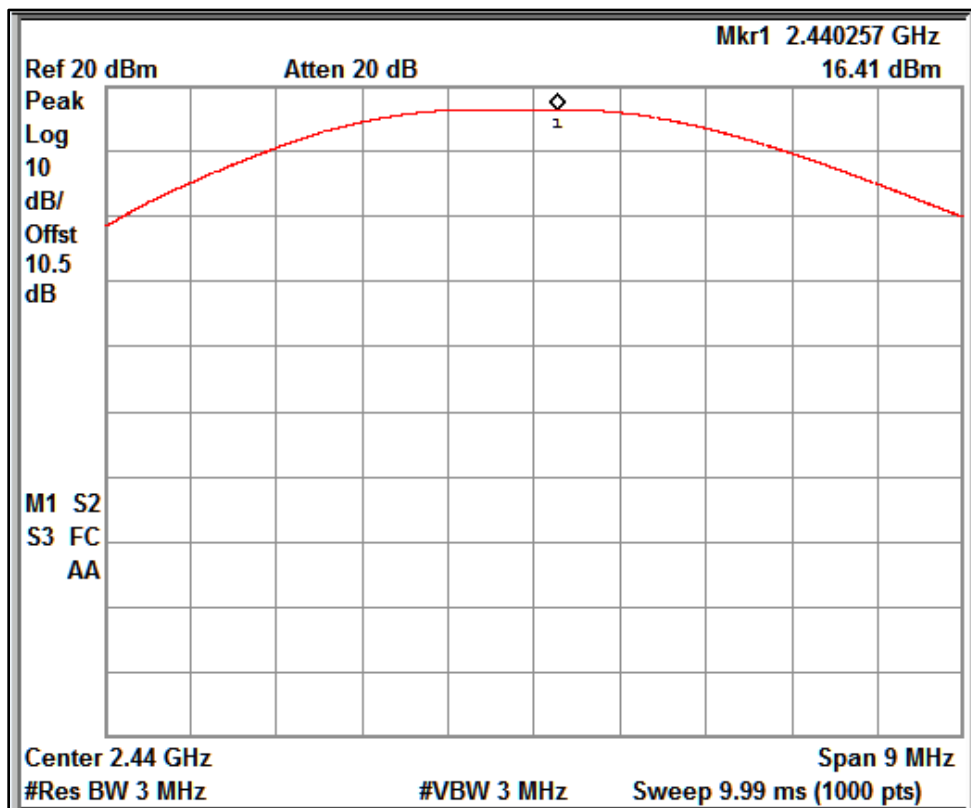
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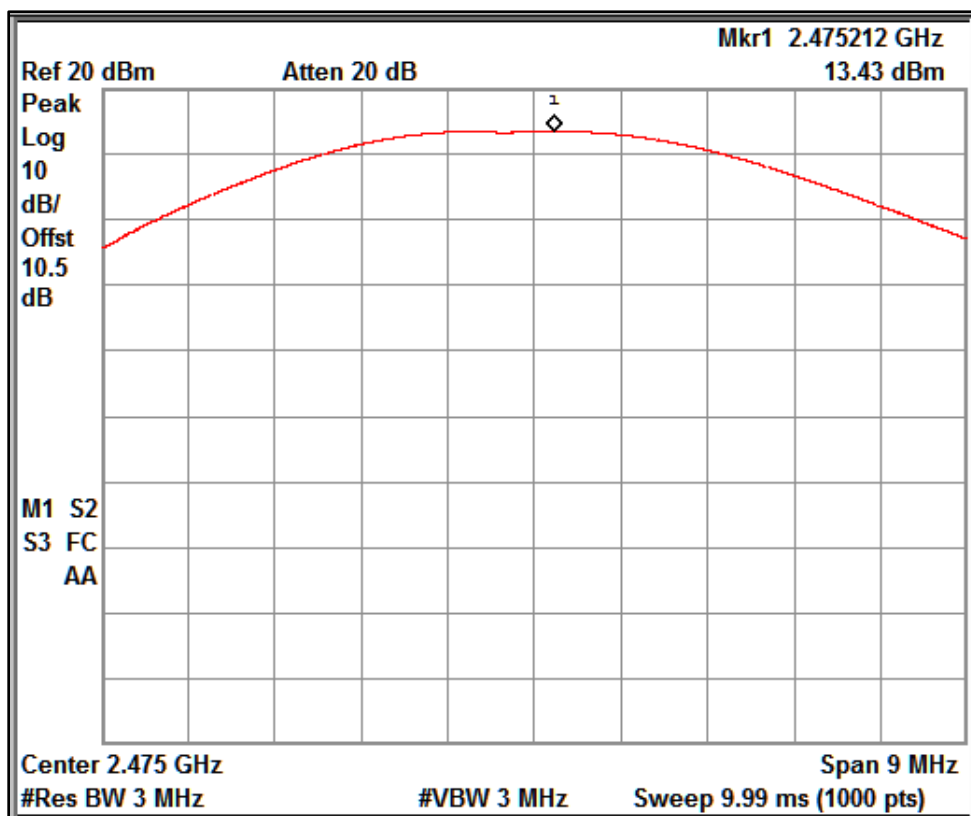
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Channel Frequency: 2440MHz



Channel Frequency: 2480MHz

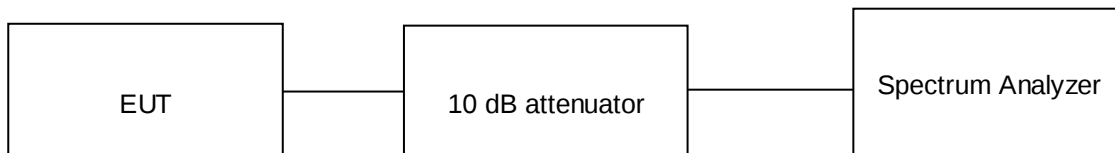
8.2 Maximum Power Spectral Density

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	3 kHz
Detector	Peak detector
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) = + 25°C

Voltage = 110VAC, 60Hz

Relative humidity: 62 %

KDB Guidelines applied:

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

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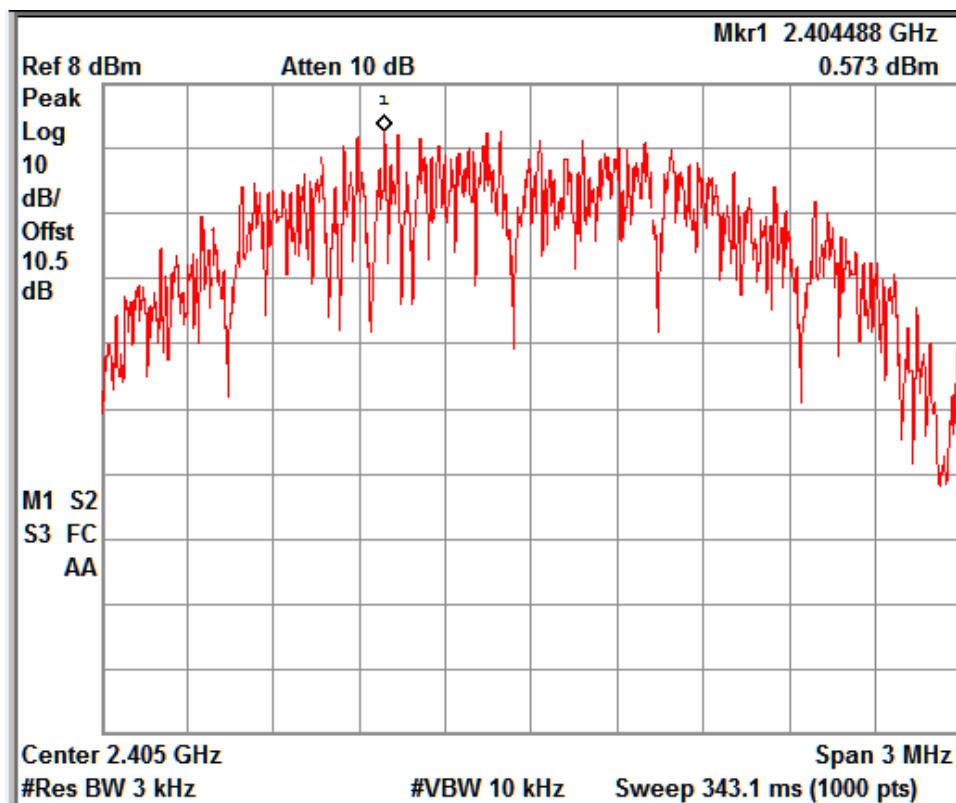
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Test results:

Note:

1. All the losses are included during measurement and final values are mentioned in the test report.
2. Total Peak PSD (dBm) = Measured Peak PSD (dBm) + Attenuator factor (10dB) + Cable loss (0.5dB)
- 3 This product do not support additional beamforming gain / directional gain, it uses two external Omni antennas with the directional gain of 4dBi and 8dBi
4. Maximum (e.i.r.p) = Maximum Peak output power (dBm) + antenna gain (dBi)

Table 7: Peak PSD test results



Channel Frequency: 2405MHz

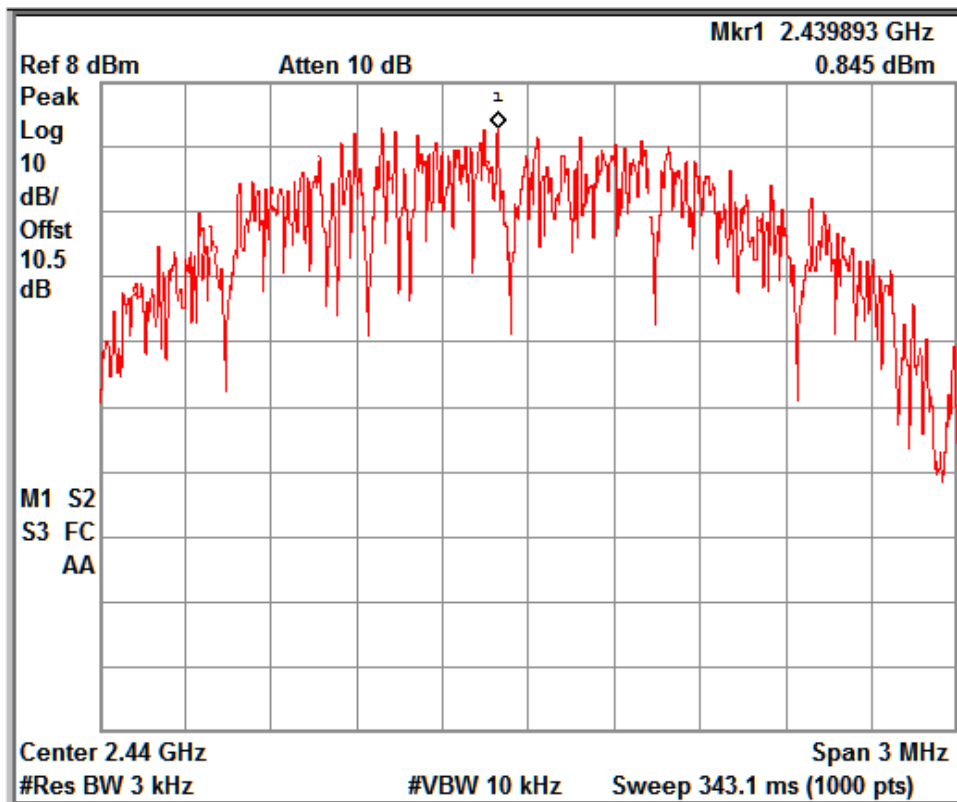
Prüfbericht - Nr.:

Test Report No.:

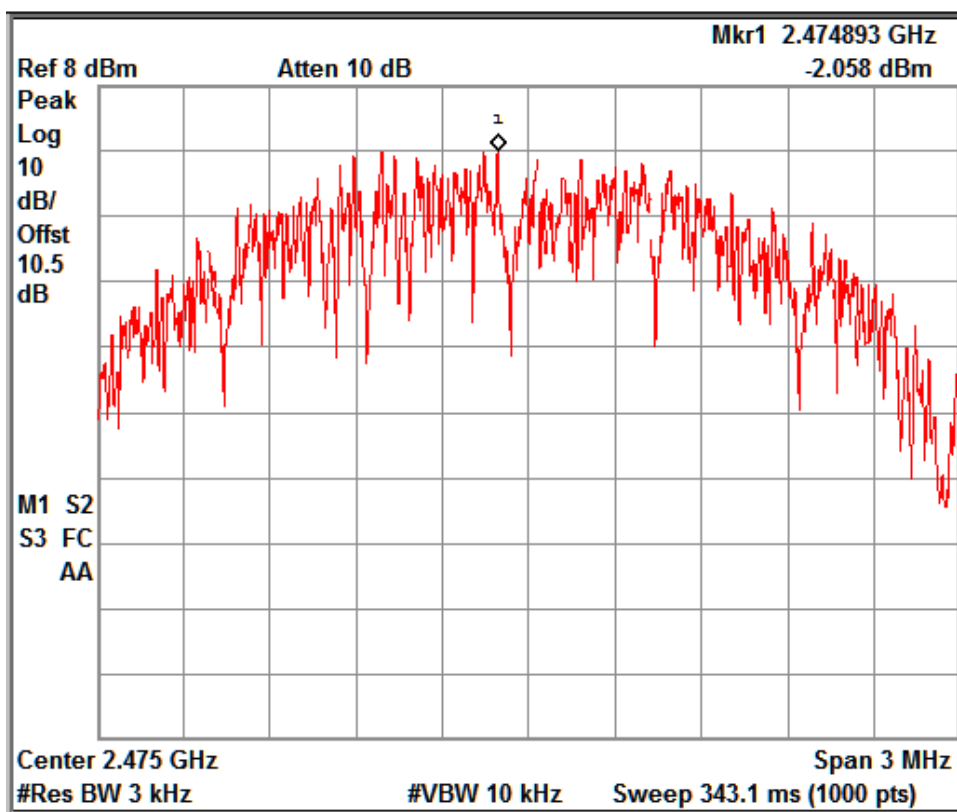
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Channel Frequency: 2440MHz



Channel Frequency: 2480MHz

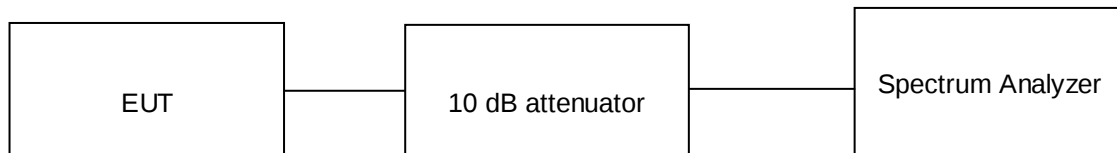
8.3 DTS Bandwidth

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 of ANSI C63.10
Measurement Bandwidth	100 kHz
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) = + 25 °C

Voltage = 110 VAC, 60Hz

Relative humidity: 62 %

KDB Guidelines applied:

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

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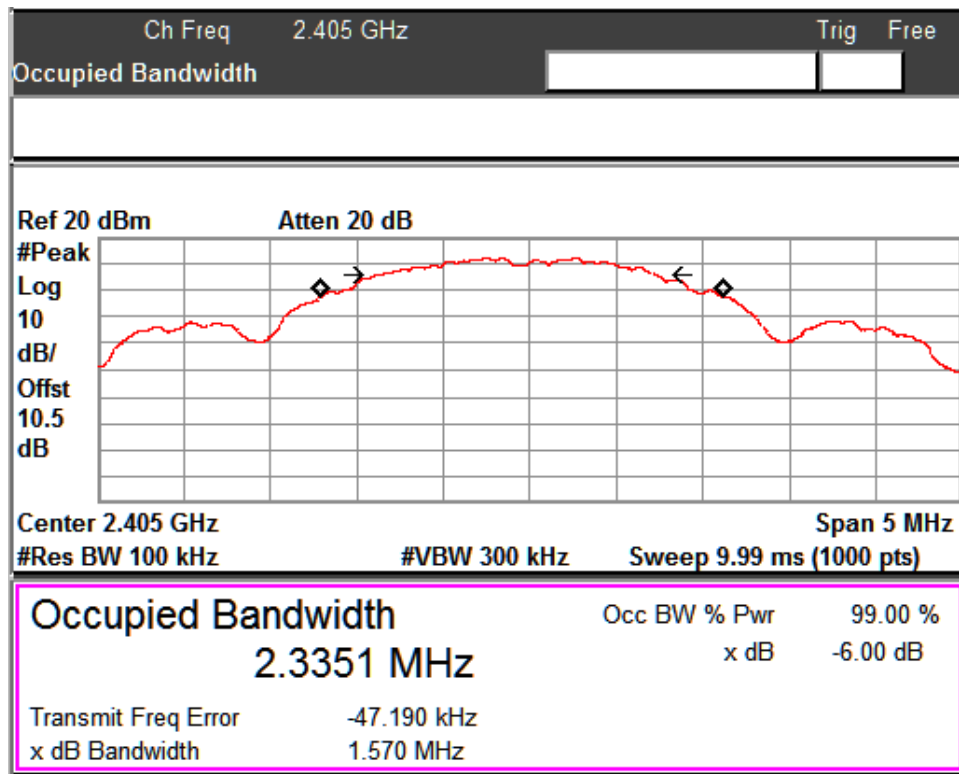
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Test results:

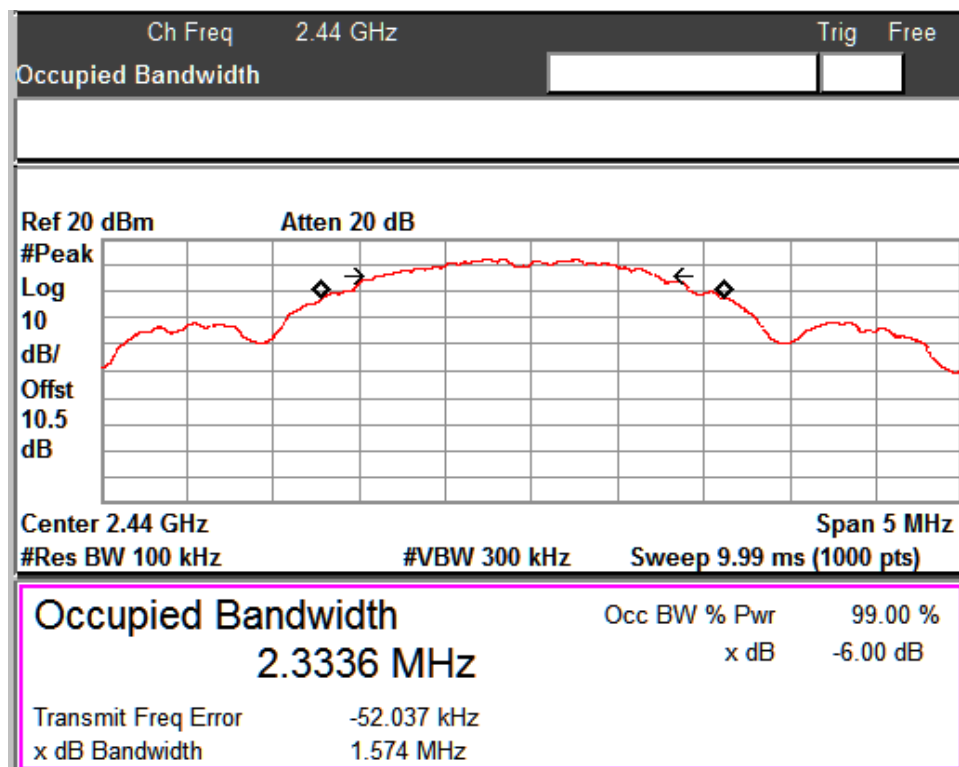
Note:

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

Table 8: DTS Bandwidth & OBW test results



Channel Frequency: 2405MHz



Channel Frequency: 2440MHz

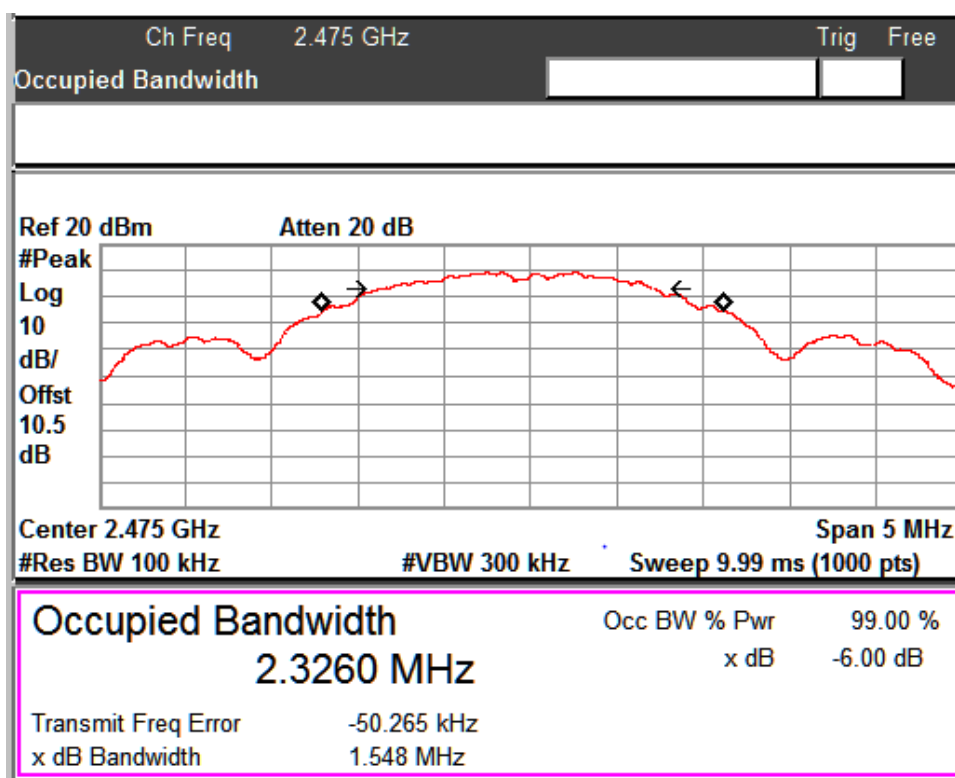
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Channel Frequency: 2480MHz

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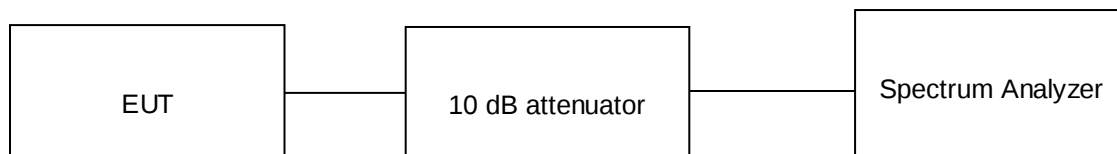
8.4 Emissions in non-restricted frequency bands and Conducted Spurious Emission

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 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 Method:



Test Condition

Normal Test Condition:

Temperature (Norm) = +25 °C

Voltage = 110VAC, 60Hz

Relative humidity: 62 %

KDB Guidelines applied:

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

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Test results:

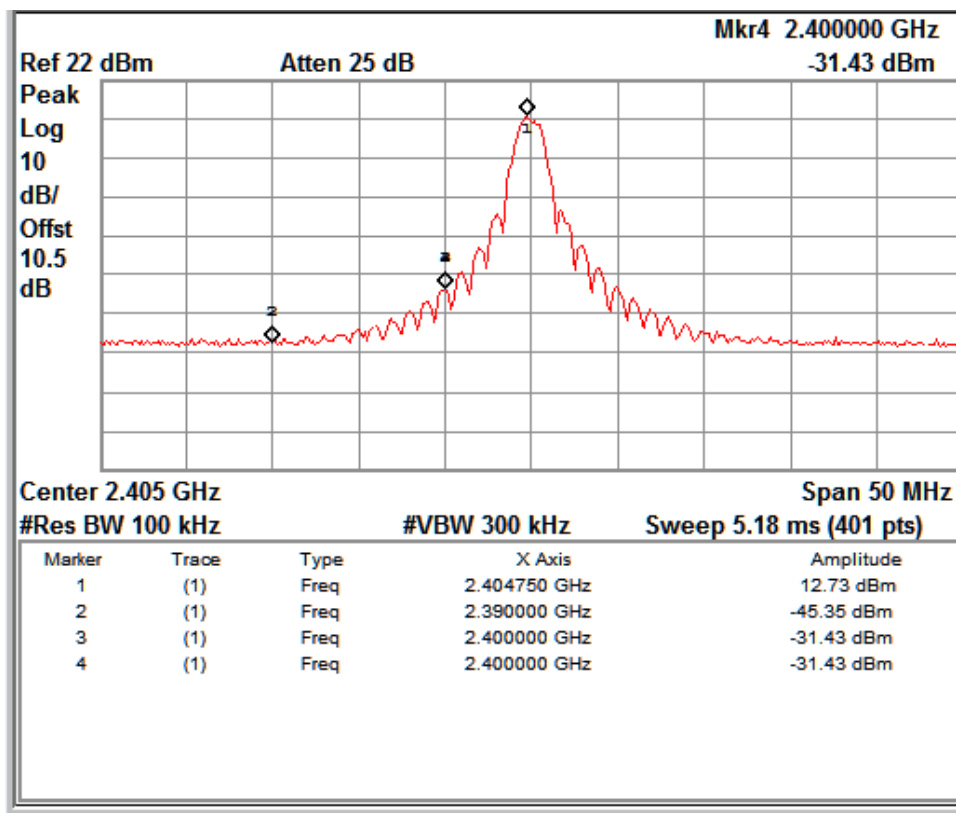
Note:

1. All the losses are included during measurement and final values are mentioned in the test report.
2. Total Peak PSD (dBm) = Measured Peak PSD (dBm) + Attenuator factor (10dB) + Cable loss (0.5dB)
- 3 This product do not support additional beamforming gain / directional gain, it uses two external Omni antennas with the directional gain of 4dBi and 8dBi
4. Maximum (e.i.r.p) = Maximum Peak output power (dBm) + antenna gain (dBi)

8.4.1 Non restricted bands measurement plots

Table 9: Emissions in non-resrticted bands measurement results

Data Rate	Channel Frequency (MHz)	Reference Value (B)	Band edge Frequency	Value at Band edge (A)	A-B	Minimum Limit
(Kbps)	(MHz)	(dBm)	(MHz)	(dBm)	(dB)	(dBc)
250	2405	12.73	2400	-31.43	-44.16	20
	2475	9.77	2483.5	-45.38	-55.15	20



Channel frequency 2405MHz

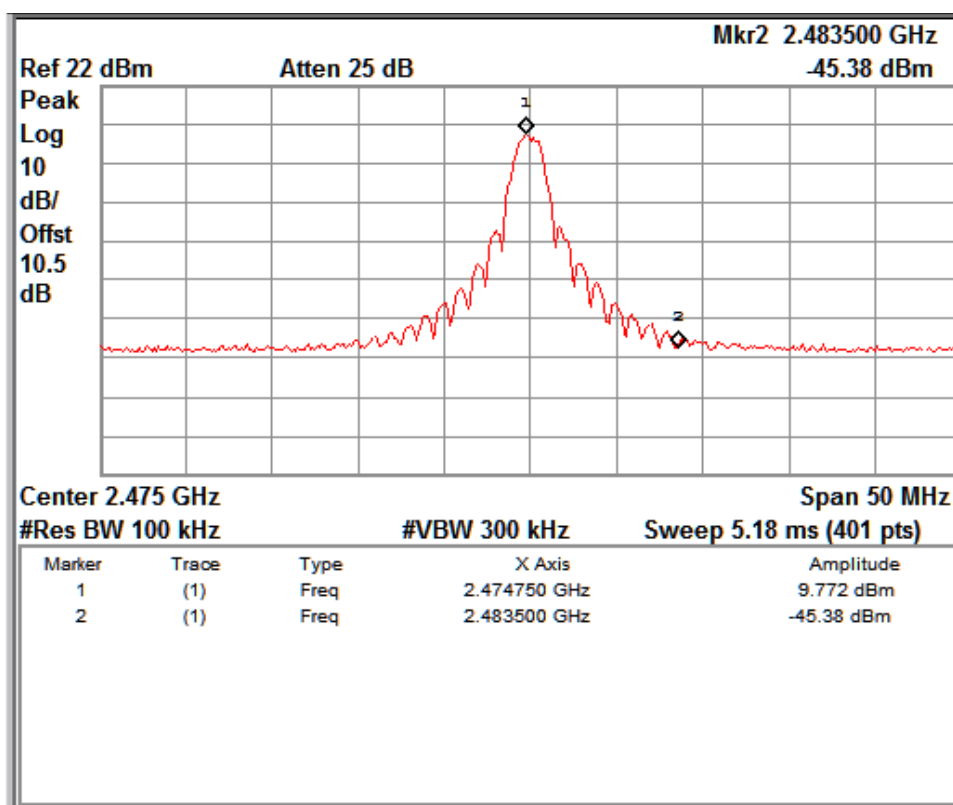
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000020F

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Channel Frequency 2475MHz

Prüfbericht - Nr.:

Test Report No.:

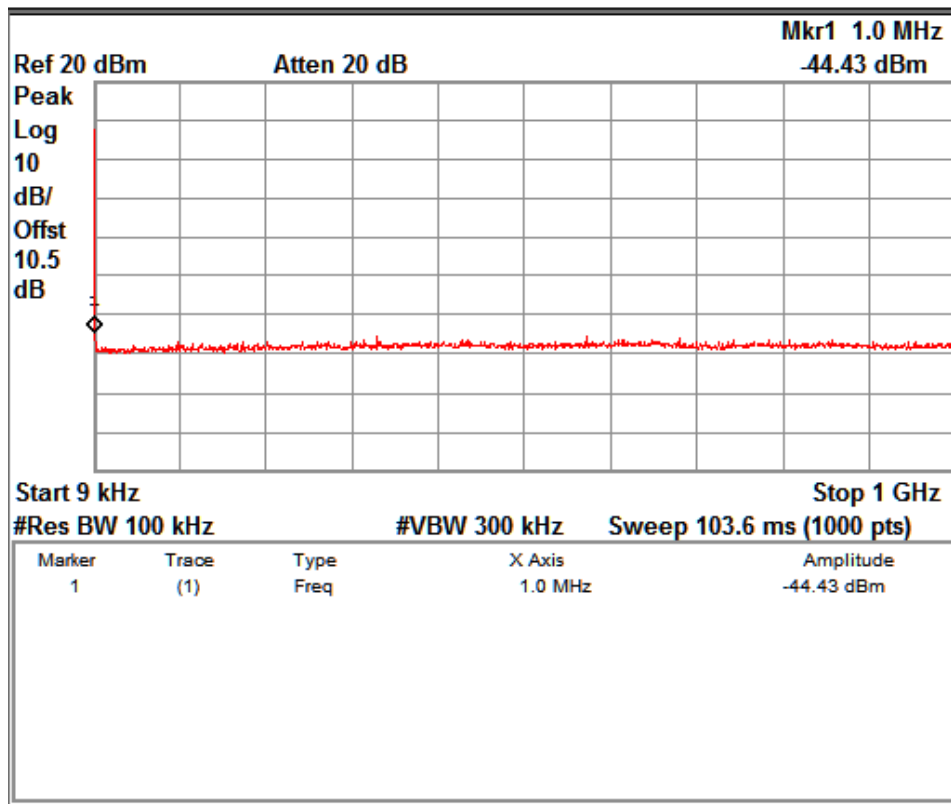
ULR-TC568820300000020F

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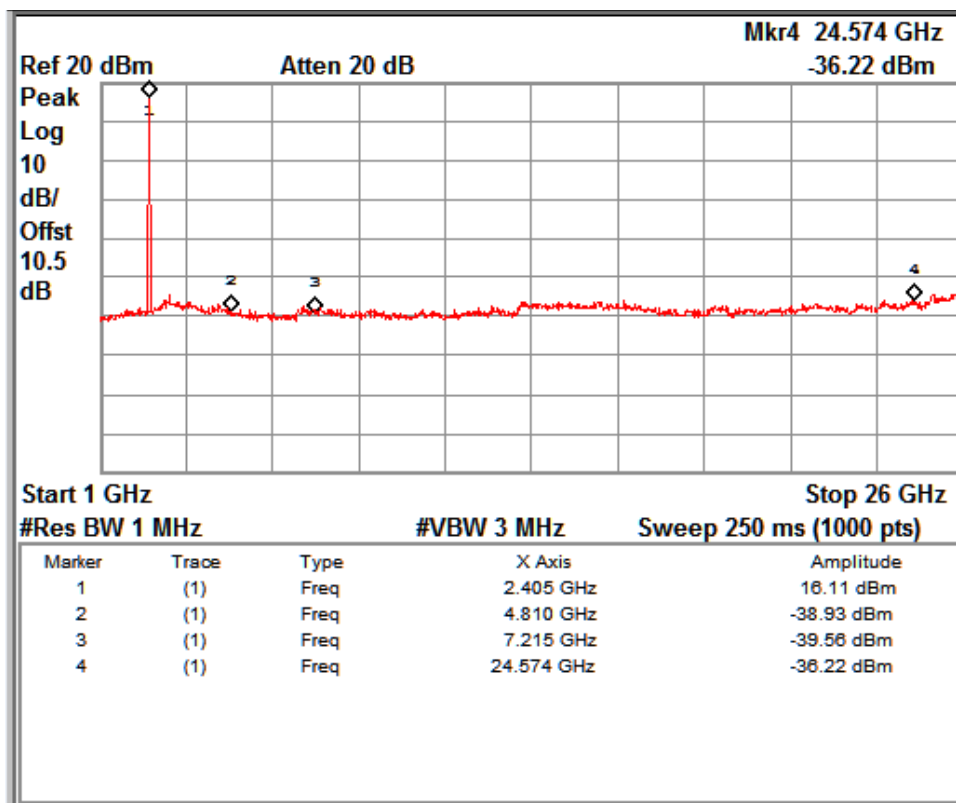
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8.4.2 Out-Of-Band Emissions

Channel frequency 2405MHz



9KHz to 1GHz



1GHz to 26GHz

Prüfbericht - Nr.:

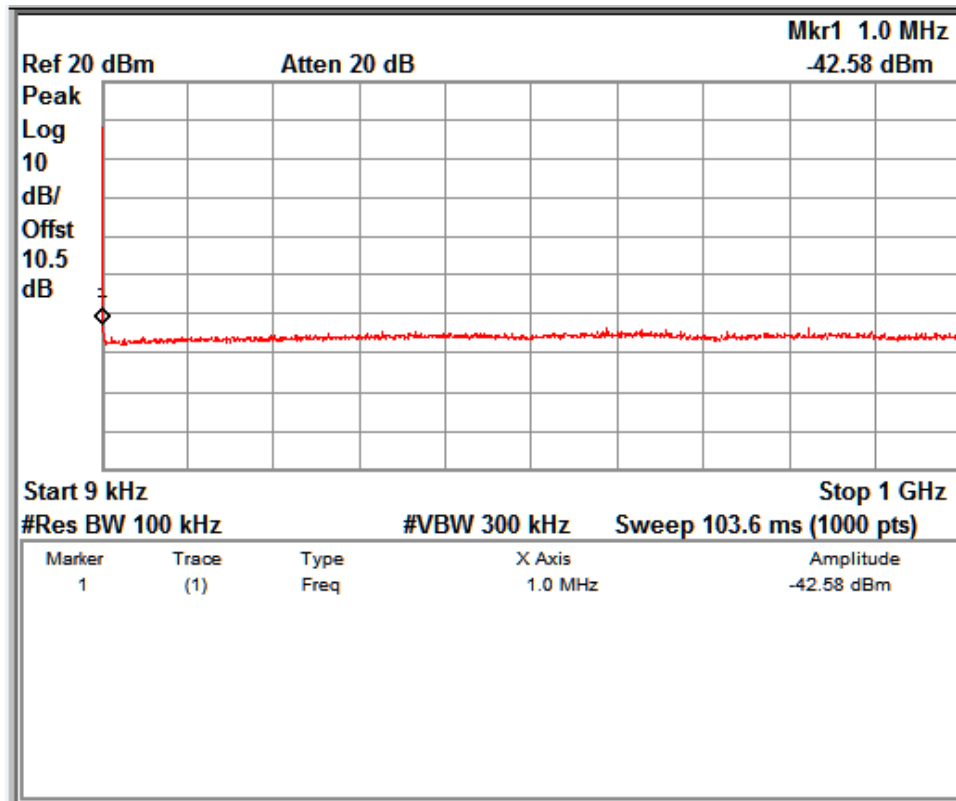
Test Report No.:

ULR-TC568820300000020F

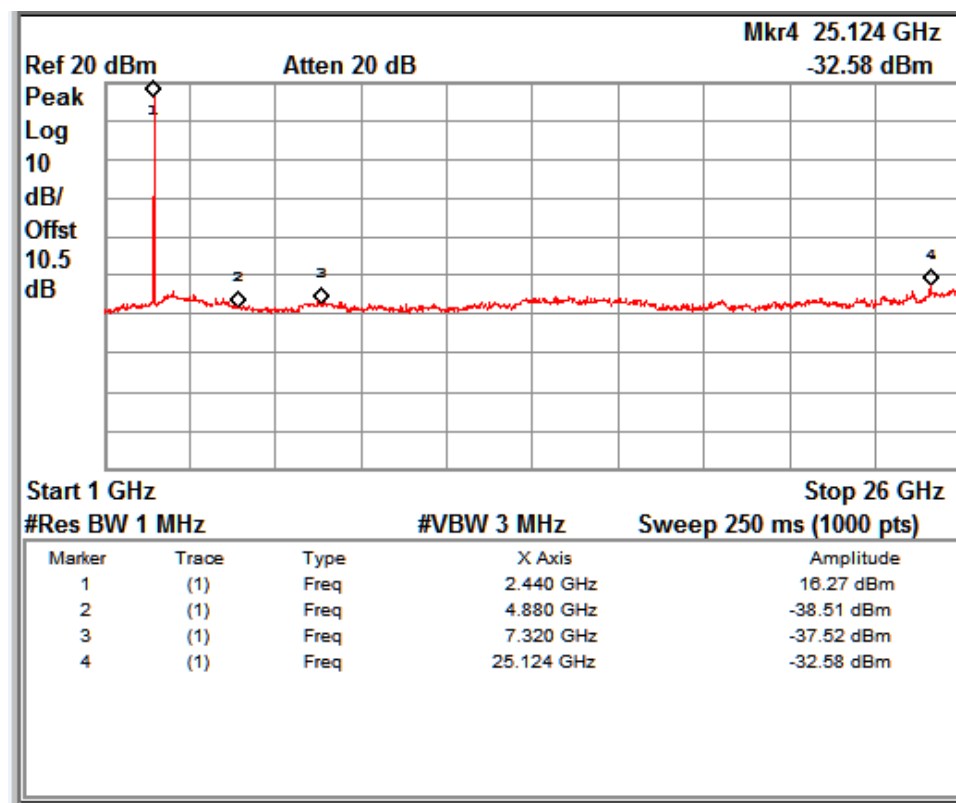
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Channel frequency 2440MHz



9KHz to 1GHz



1GHz to 26GHz

Prüfbericht - Nr.:

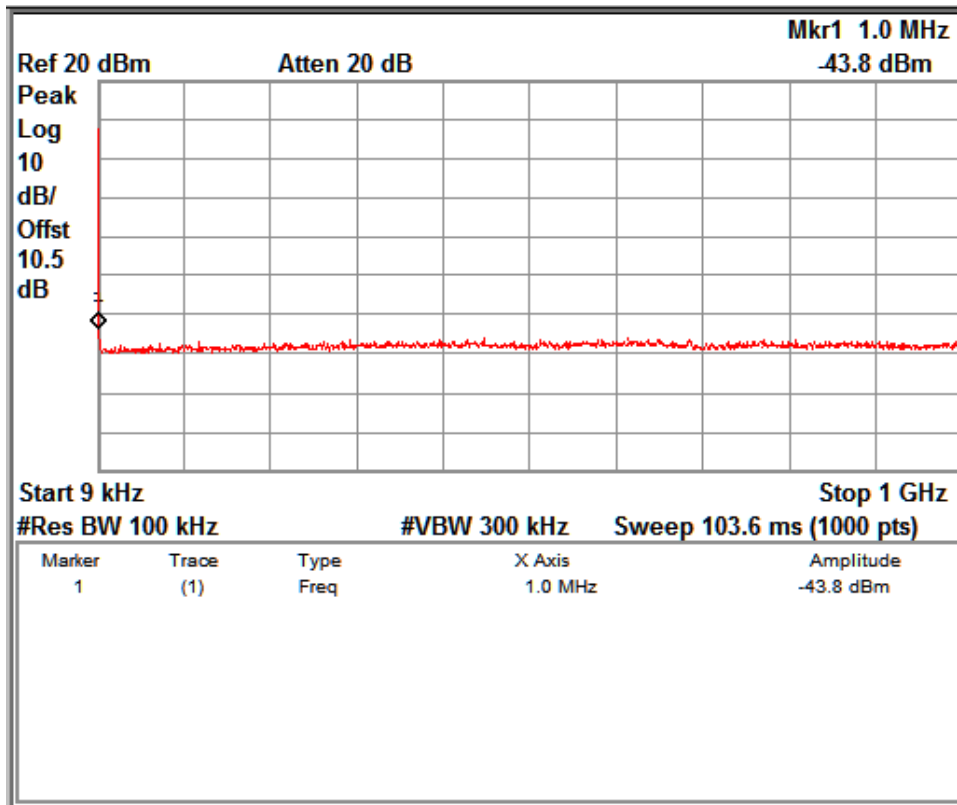
Test Report No.:

ULR-TC568820300000020F

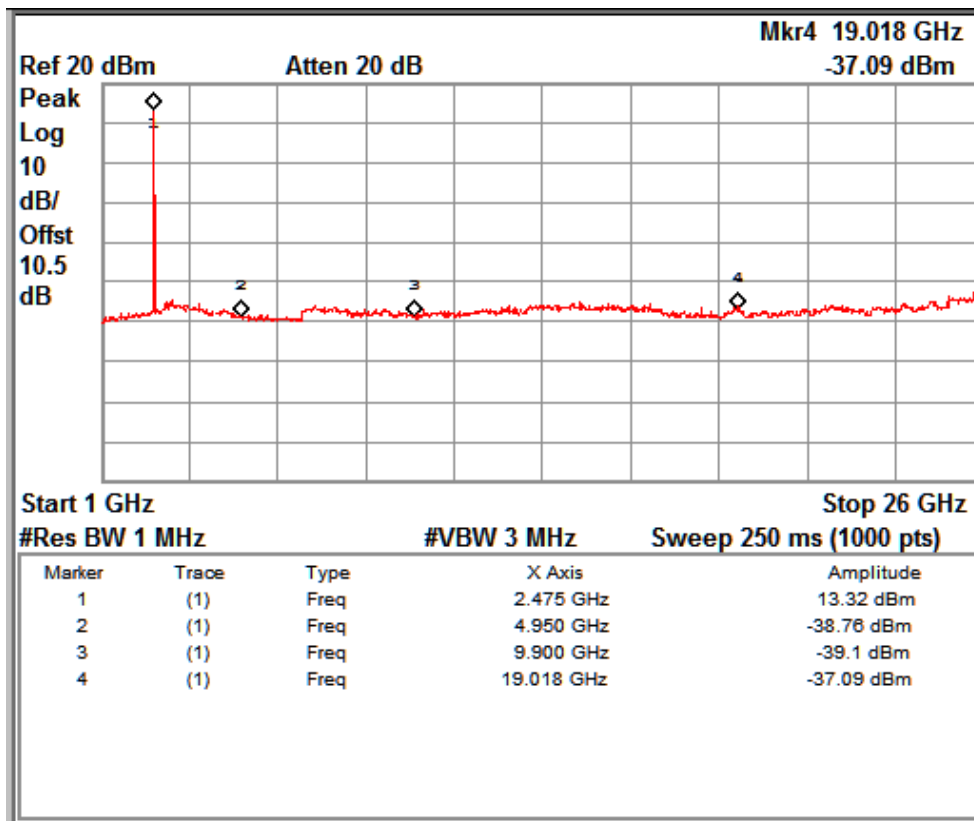
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Channel frequency 2480MHz



9KHz to 1GHz



1GHz to 26GHz

8.5 Spurious Radiated Emissions & Restricted Bands of Operation

Result

Pass

Test Specification	FCC part 15 Subpart C 15.247 (d) / (15.209 & 15.205) / IC RSS-GEN, Section 8.9 and 8.10
Test Method	ANSI C63.10
Measurement Location	Semi anechoic chamber <1GHz Fully anechoic chamber >1GHz
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	Reffer TEST METHODOLOGY

Table 10: 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) = + 25 °C

Voltage = 110VAC , 60Hz

Relative humidity = 62 %

Prüfbericht - Nr.:

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Test results:

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

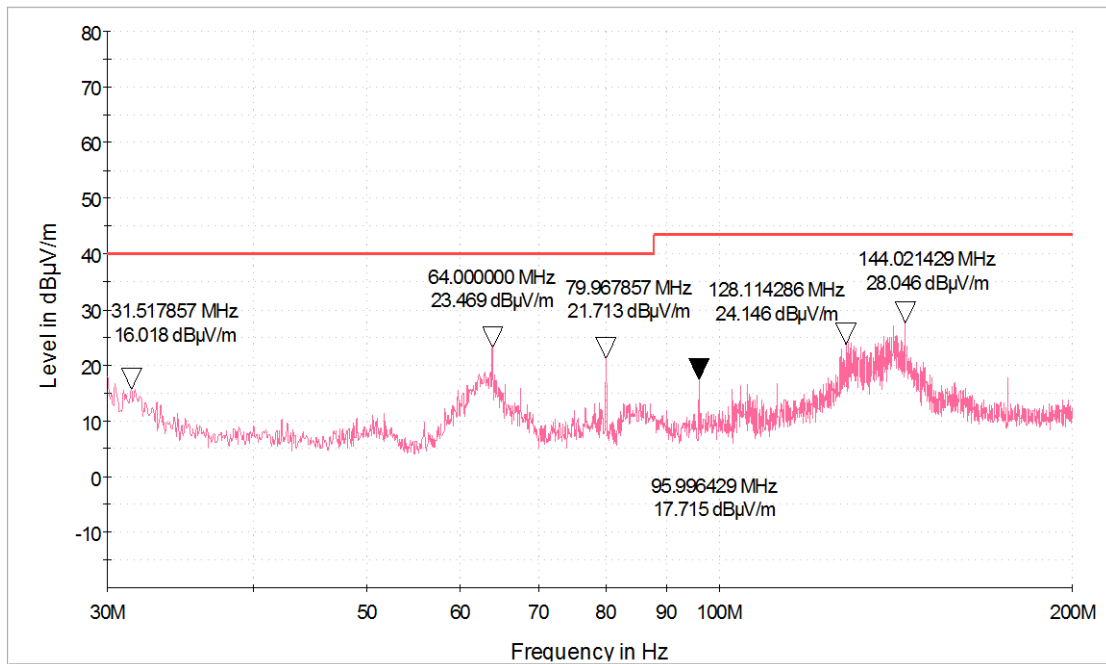
Test results for frequency range 9kHz – 30MHz

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

Test results for frequency range 30MHz – 200MHz

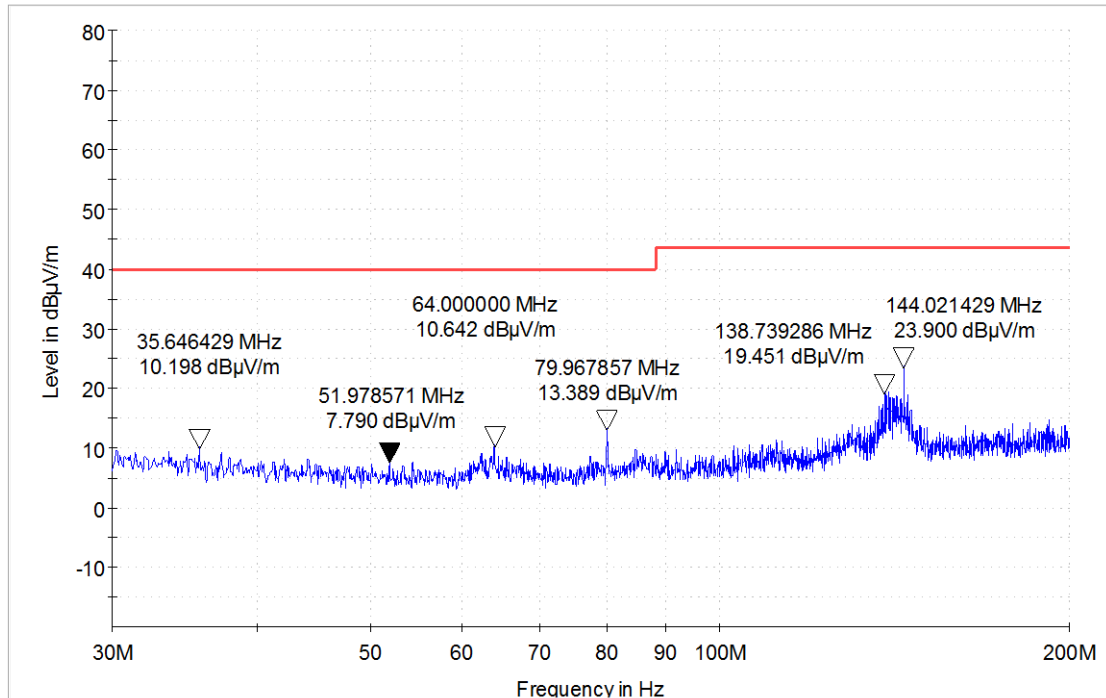
Test Result:

Antenna Polarization	Measured Frequency (MHz)	Quasi Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)
Vertical	64.00	23.46	40	-16.54
Vertical	128.11	24.14	40	-15.86
Vertical	144.02	28.04	40	-11.96
Horizontal	144.02	23.90	40	-16.10



Channel Frequency 30MHz – 200MHz

Polarization Vertical



Channel Frequency 30MHz – 200MHz

Polarization Horizontal

Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000020F

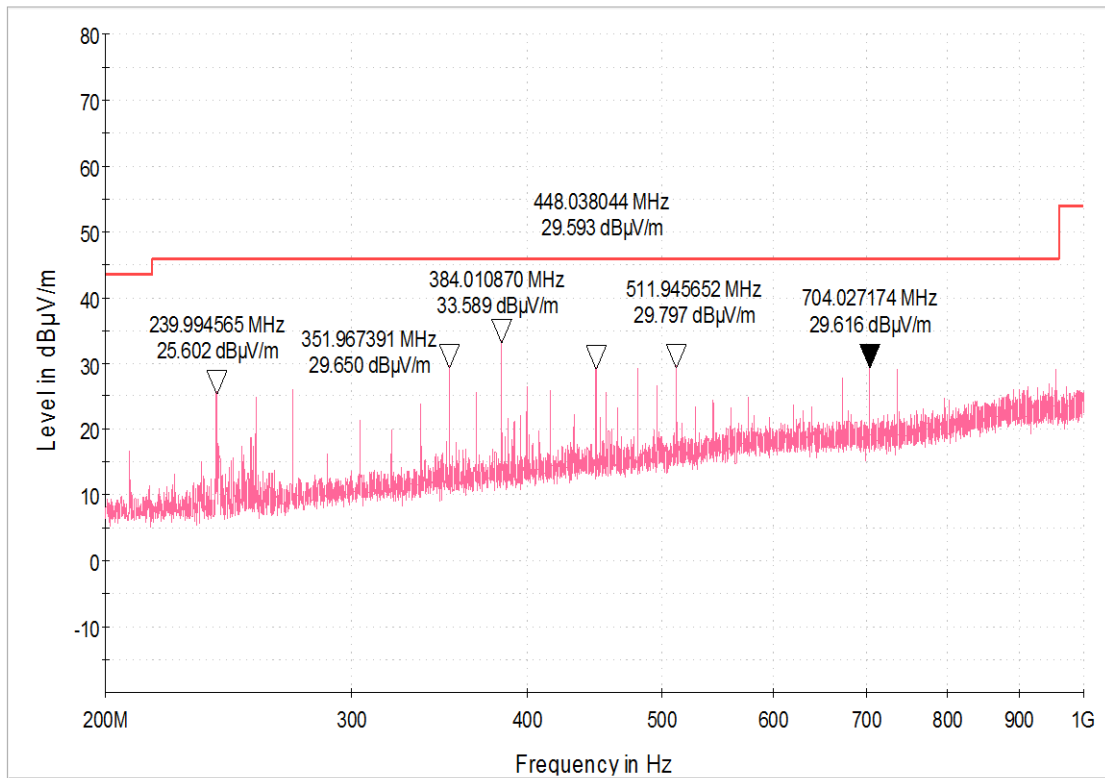
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Test results for frequency range 200MHz-1GHz

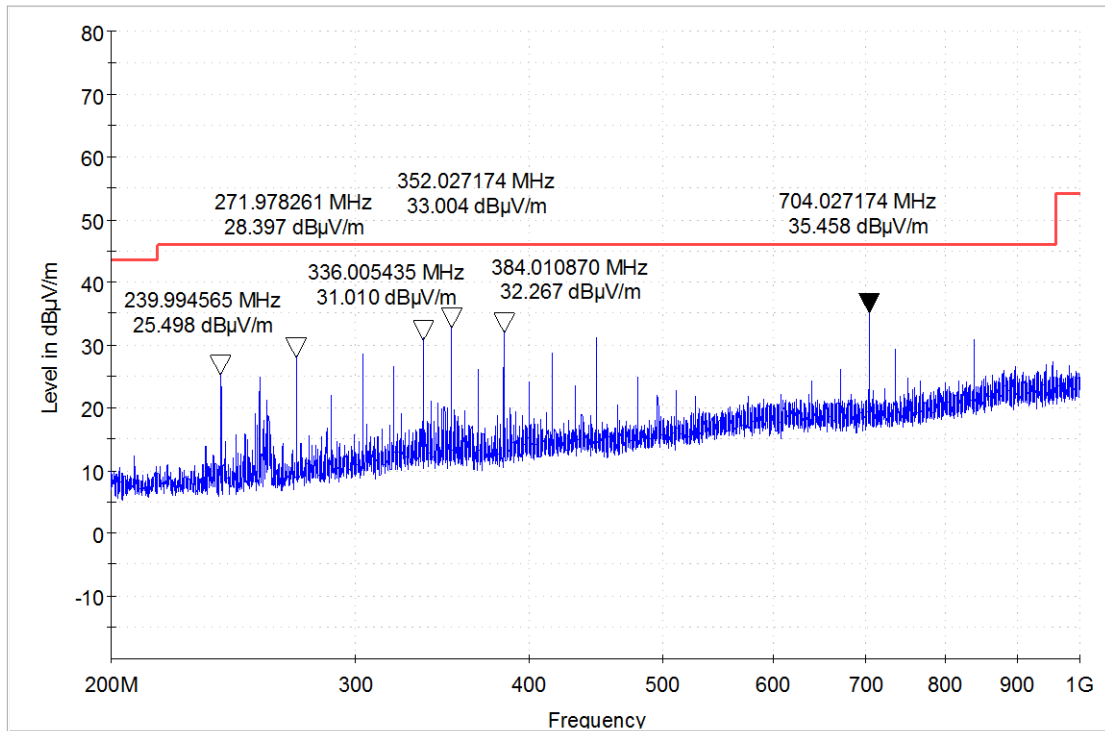
Test Result:

Antenna Polarization	Measured Frequency (MHz)	Quasi Peak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
Vertical	351.96	29.65	46	-16.35
	384.01	33.58	46	-12.42
	448.03	29.59	46	-16.41
	511.94	29.79	46	-16.21
	704.02	29.61	46	-16.39
Horizontal	271.97	28.39	46	-17.61
	336.00	31.01	46	-14.99
	352.027	33.00	46	-13.00
	384.01	32.26	46	-13.74
	704.02	35.45	46	-10.55



Channel Frequency 200MHz to 1GHz

Polarization Vertical



Channel Frequency 200MHz to 1GHz

Polarization Horizontal

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Test results for the frequencies above 1GHz

4 dBi omni Antenna

Channel Frequency (MHz)	Antenna Polarization	Measured Frequency (MHz)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2405	Vertical	2390(Pk)	51.10	74*	-22.90
		2390(Av)	41.06	54*	-12.94
		2405(Pk)	114.17	-	*
		2405(Av)	111.03	-	*
		4810(Pk)	43.05	74	-30.95
		4810(Av)	30.26	54	-23.74
		7215(Pk)	49.16	74	-24.84
		7215(Av)	37.31	54	-16.69
	Horizontal	2390(Pk)	40.61	74*	-33.39
		2390(Av)	29.54	54*	-24.46
		2405(Pk)	101.40	-	*
		2405(Av)	98.23	-	*
		4810(Pk)	42.38	74	-31.62
		4810(Av)	28.53	54	-25.47
		7215(Pk)	48.39	74	-25.61
		7215(Av)	35.43	54	-18.57
2440	Vertical	2440(Pk)	113.78	-	*
		2440(Av)	111.57	-	*
		4880(Pk)	44.28	74	-29.72
		4880(Av)	30.67	54	-23.33
		7320(Pk)	49.97	74	-24.03
		7320(Av)	38.12	54	-15.88
	Horizontal	2440(Pk)	100.67	-	*
		2440(Av)	97.59	-	*
		4880(Pk)	49.11	74	-24.89
		4880(Av)	35.83	54	-18.17
2475	Vertical	7320(Pk)	49.11	74	-24.89
		7320(Av)	35.83	54	-18.17
		2475(Pk)	111.72	-	*
		2475(Av)	109.34	-	*
		2483.5(Pk)	58.38	74*	-15.62
		2483.5(Av)	47.75	54*	-6.25
		4950(Pk)	45.21	74	-28.79
		4950(Av)	34.84	54	-19.16
	Horizontal	7425(Pk)	49.19	74	-24.81
		7425(Av)	36.45	54	-17.55
		2475(Pk)	98.64	-	*
		2475(Av)	95.21	-	*
		2483.5(Pk)	45.28	74*	-28.72
		2483.5(Av)	34.74	54*	-19.26
		4950(Pk)	43.34	74	-30.66
		4950(Av)	29.31	54	-24.69
		7425(Pk)	49.09	74	-24.91
		7425(Av)	34.79	54	-19.21

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8dBi Omni Antenna

Channel Frequency (MHz)	Antenna Polarization	Measured Frequency (MHz)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2405	Vertical	2390(Pk)	54.12	74*	-19.88
		2390(Av)	43.71	54*	-10.29
		2405(Pk)	116.9	-	-
		2405(Av)	114.1	-	-
		4810(Pk)	43.09	74	-30.91
		4810(Av)	30.56	54	-23.44
		7215(Pk)	50.76	74	-23.24
		7215(Av)	37.96	54	-16.04
	Horizontal	2390(Pk)	39.77	74*	-34.23
		2390(Av)	28.78	54*	-25.22
		2405(Pk)	99.84	-	-
		2405(Av)	97.02	-	-
		4810(Pk)	43.71	74	-30.29
		4810(Av)	28.97	54	-25.03
		7215(Pk)	48.47	74	-25.53
		7215(Av)	36.13	54	-17.87
2440	Vertical	2440(Pk)	116.51	-	-
		2440(Av)	113.85	-	-
		4880(Pk)	44.86	74	-29.14
		4880(Av)	34.41	54	-19.59
		7320(Pk)	52.14	74	-21.86
		7320(Av)	41.95	54	-12.05
	Horizontal	2440(Pk)	98.99	-	-
		2440(Av)	95.61	-	-
		4880(Pk)	42.40	74	-31.60
		4880(Av)	29.75	54	-24.25
2475	Vertical	2475(Pk)	115.85	-	-
		2475(Av)	112.45	-	-
		2483.5(Pk)	62.53	74*	-11.47
		2483.5(Av)	51.86	54*	-2.14
		4960(Pk)	49.62	74	-24.38
		4960(Av)	41.36	54	-12.64
		7440(Pk)	54.48	74	-19.52
		7440(Av)	46.35	54	-7.65
	Horizontal	2475(Pk)	93.68	-	-
		2475(Av)	96.01	-	-
		2483.5(Pk)	44.7	74*	-29.30
		2483.5(Av)	33.82	54*	-20.18
		4960(Pk)	43.95	74	-30.05
		4960(Av)	29.84	54	-24.16
		7440(Pk)	49.28	74	-24.72
		7440(Av)	34.84	54	-19.16

- : Fundamental Frequency

*- : Indicate restricted band of operation §15.205

Pk: Peak Detector; Av: Average Detector

Prüfbericht - Nr.:

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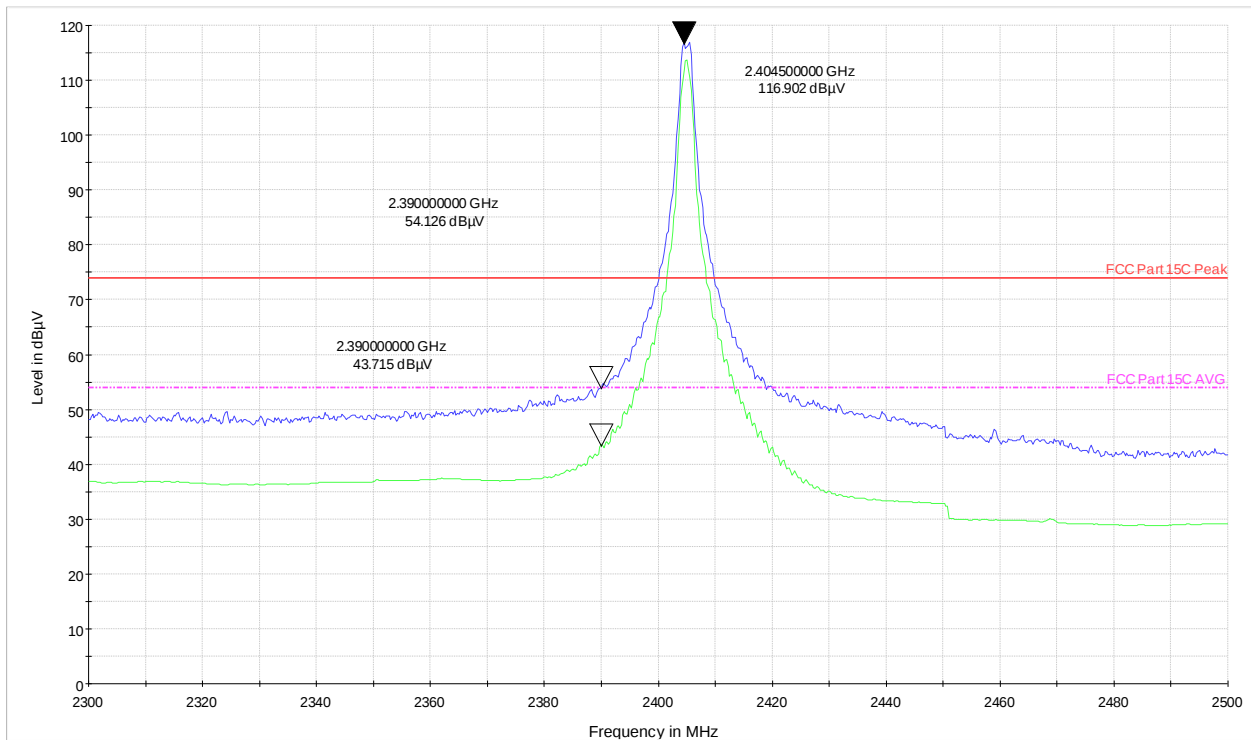
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Worst case Plots

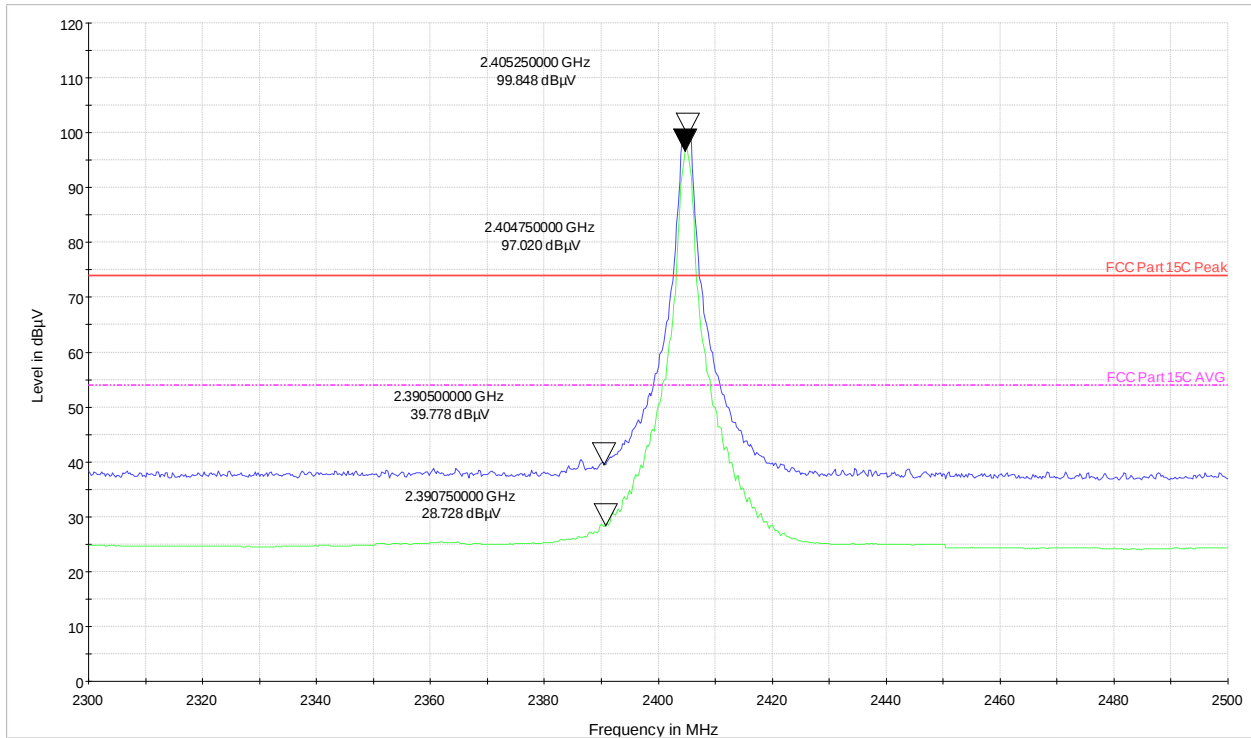
Restricted bands check

8 dBi omni antenna



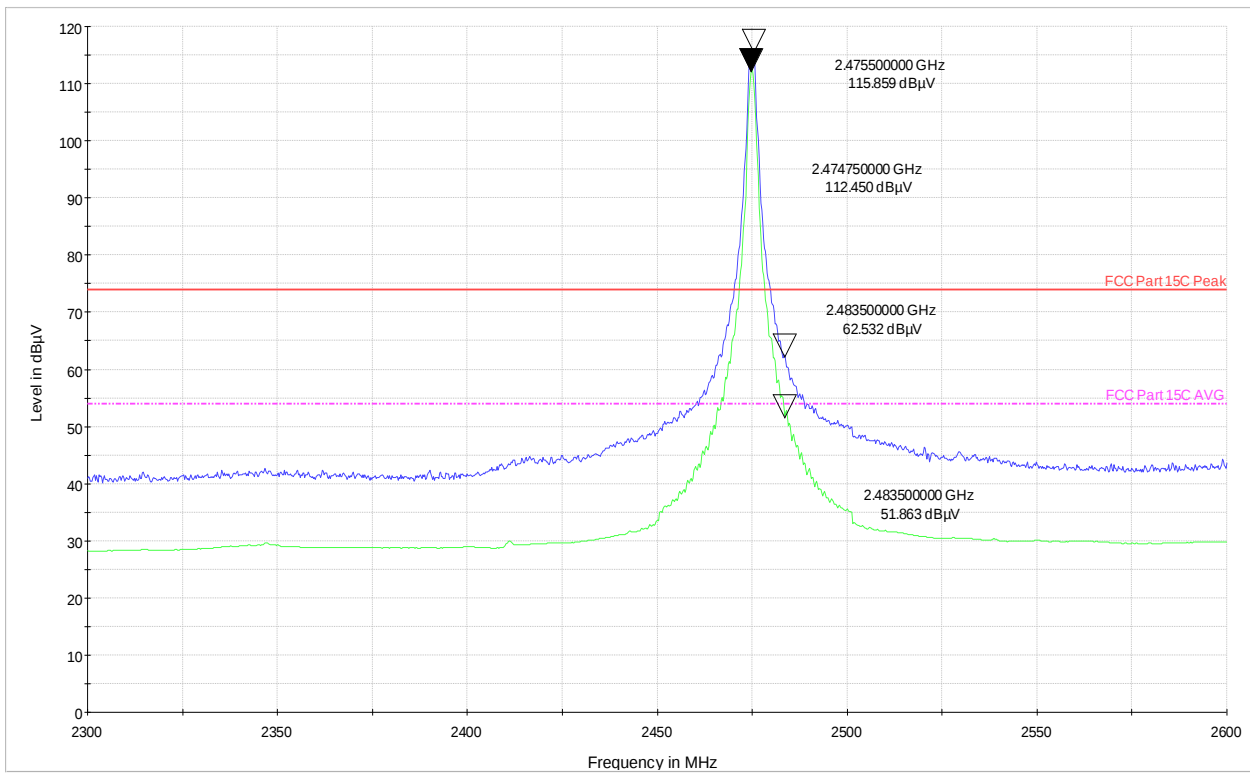
Channel frequency: 2405MHz

Polarization: Vertical



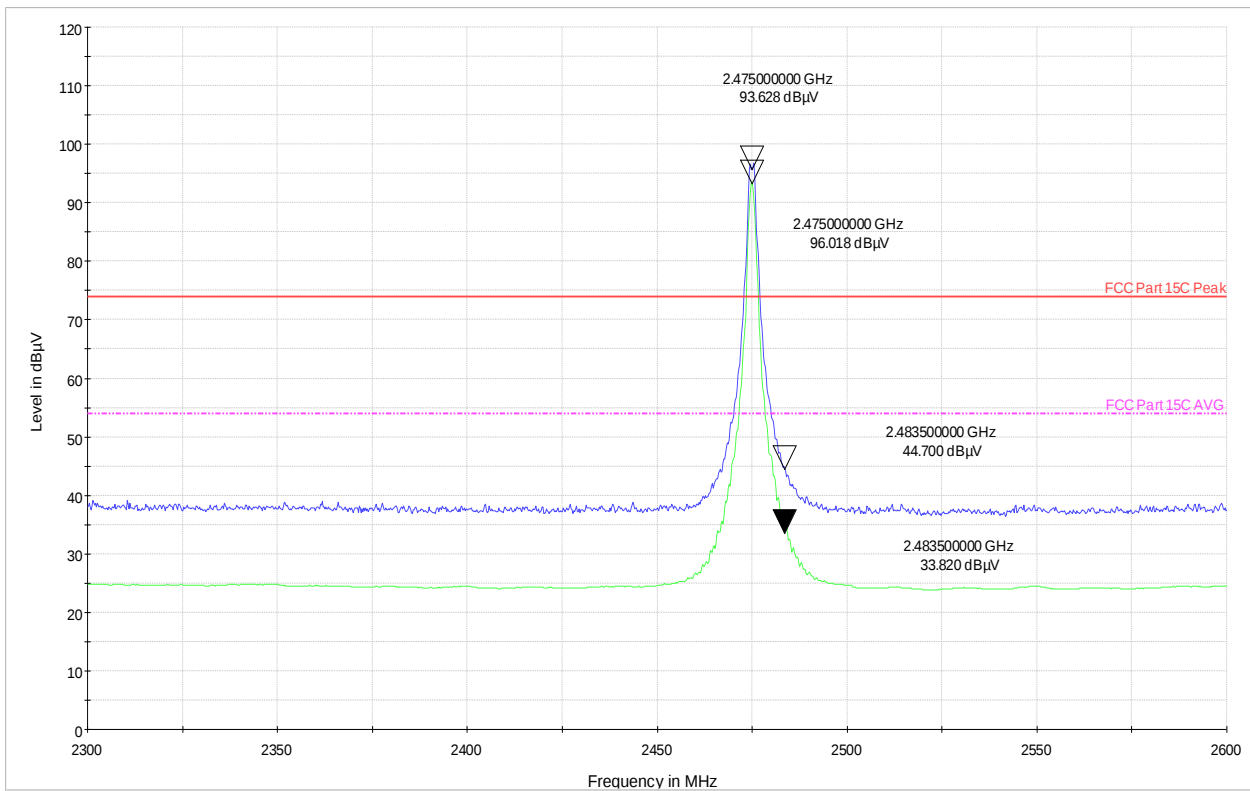
Channel frequency: 2405MHz

Polarization: Horizontal



Channel Frequency: 2475MHz

Polarization: Vertical

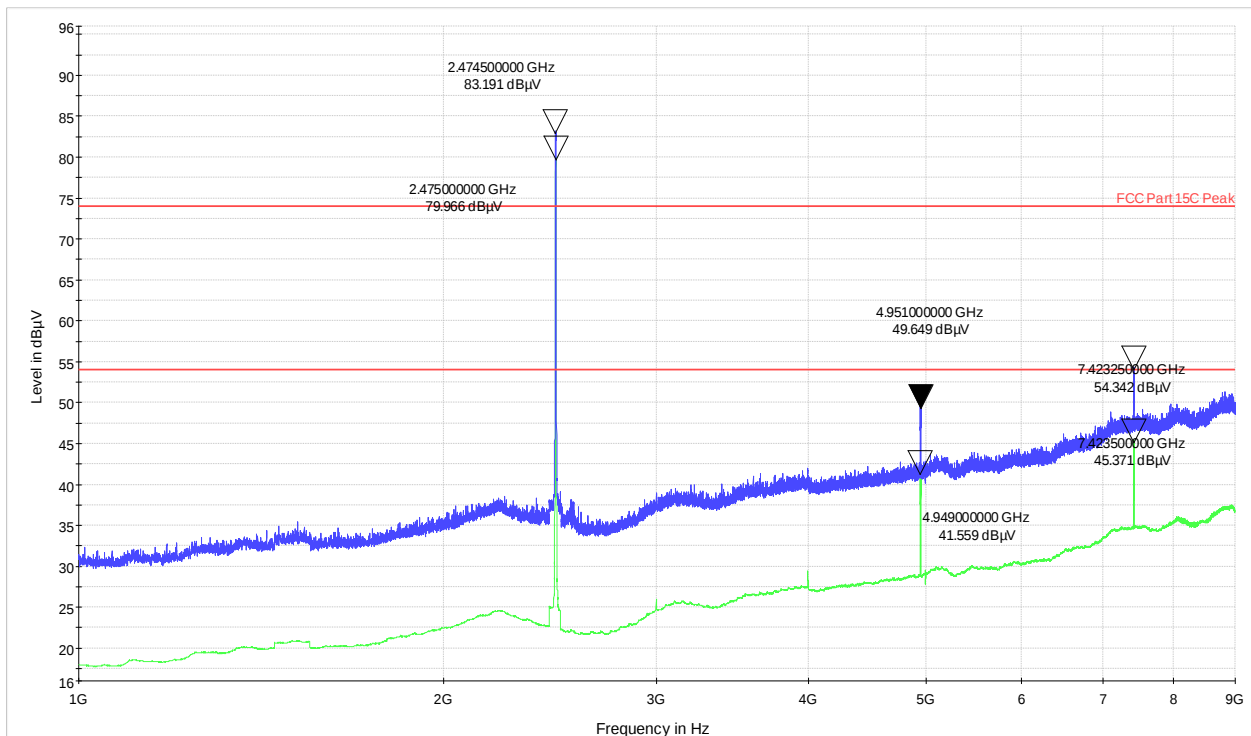


Channel Frequency: 2475MHz

Polarization: Horizontal

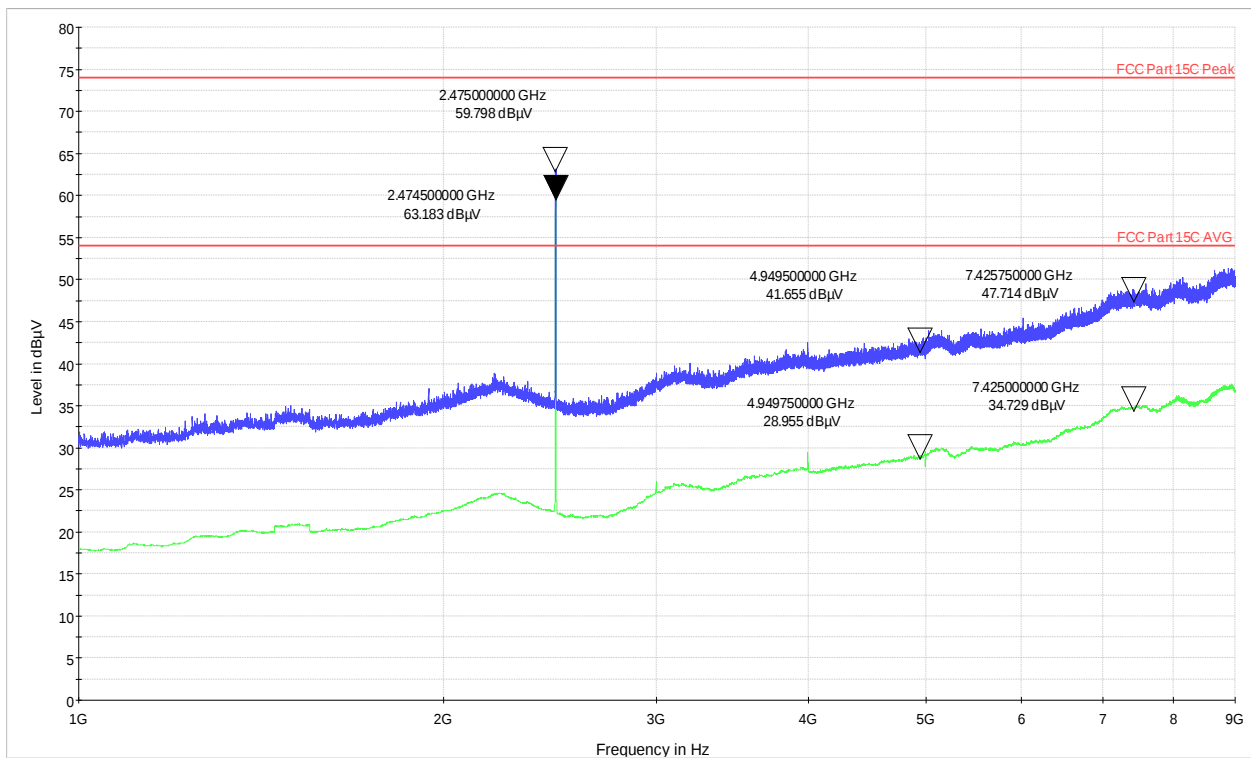
Spurious radiated emissions 1 to 26GHz

Channel frequency 2475MHz



Frequency range: 1-9GHz

Polarization: Vertical



Frequency range: 1-9GHz

Polarization: Horizontal

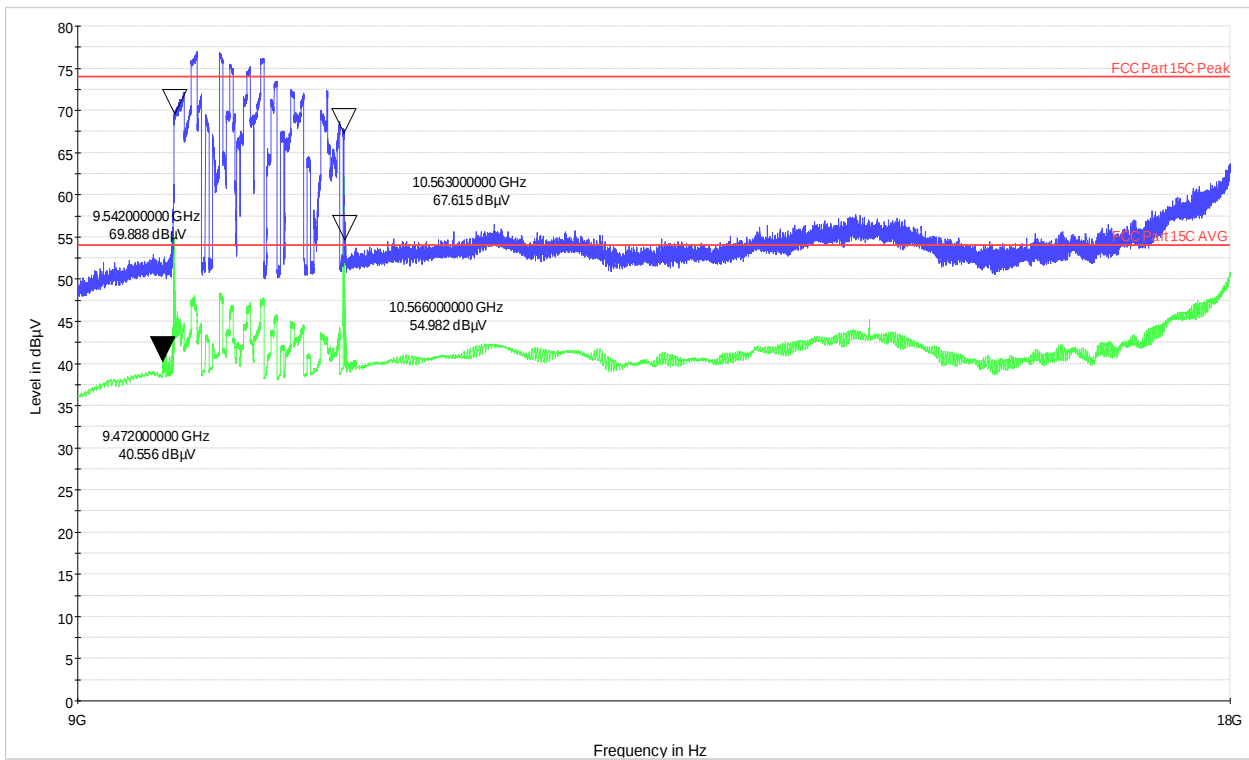
Prüfbericht - Nr.:

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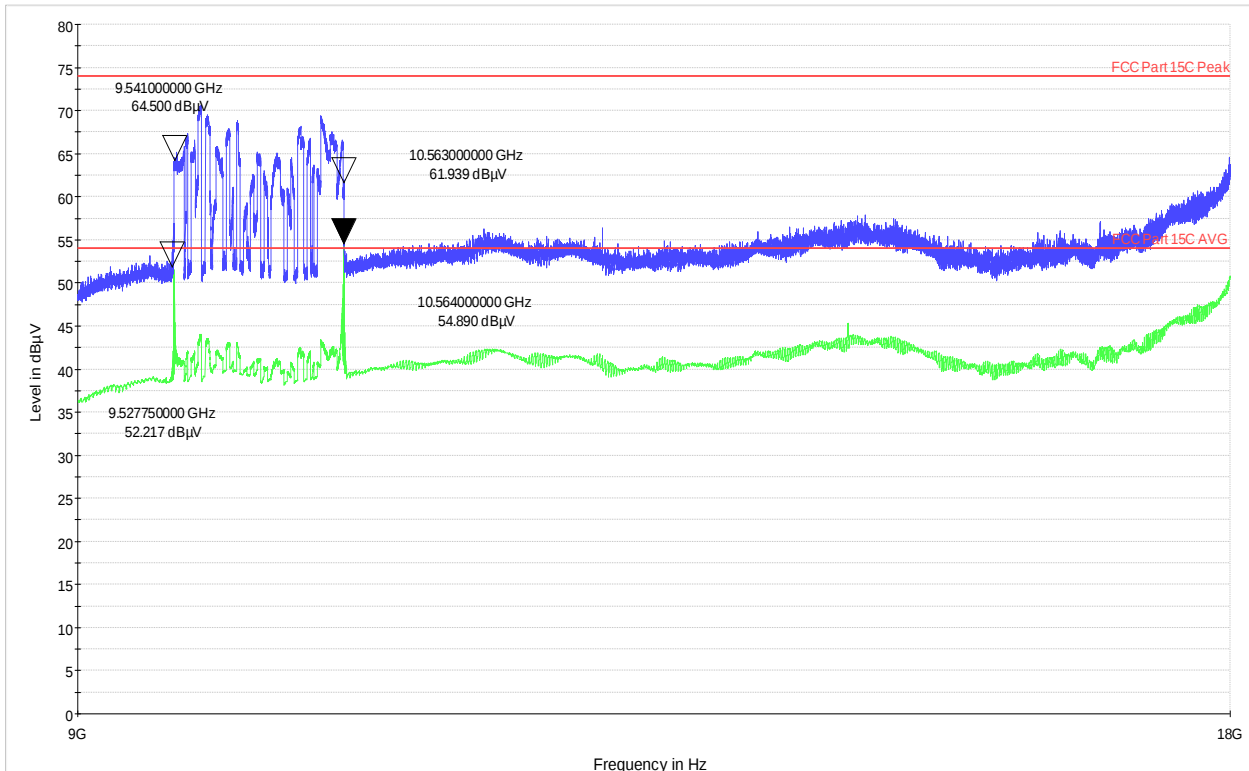
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Frequency range: 9GHz to 18GHz

Polarization: Vertical

Note: Emissions in frequency range 9.54GHz to 10.56GHz is intended emission of radar module.



Frequency range: 9GHz to 18GHz

Polarization: Horizontal

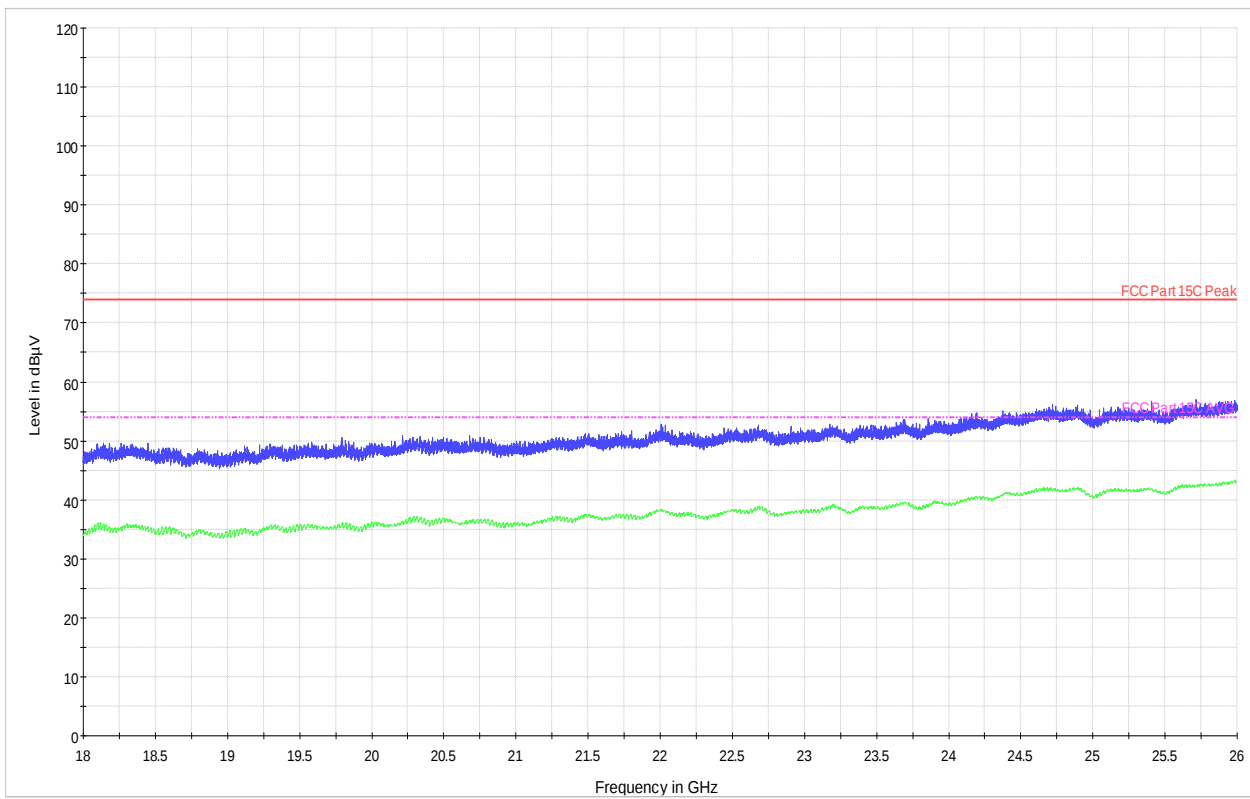
Prüfbericht - Nr.:

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ULR-TC568820300000020F

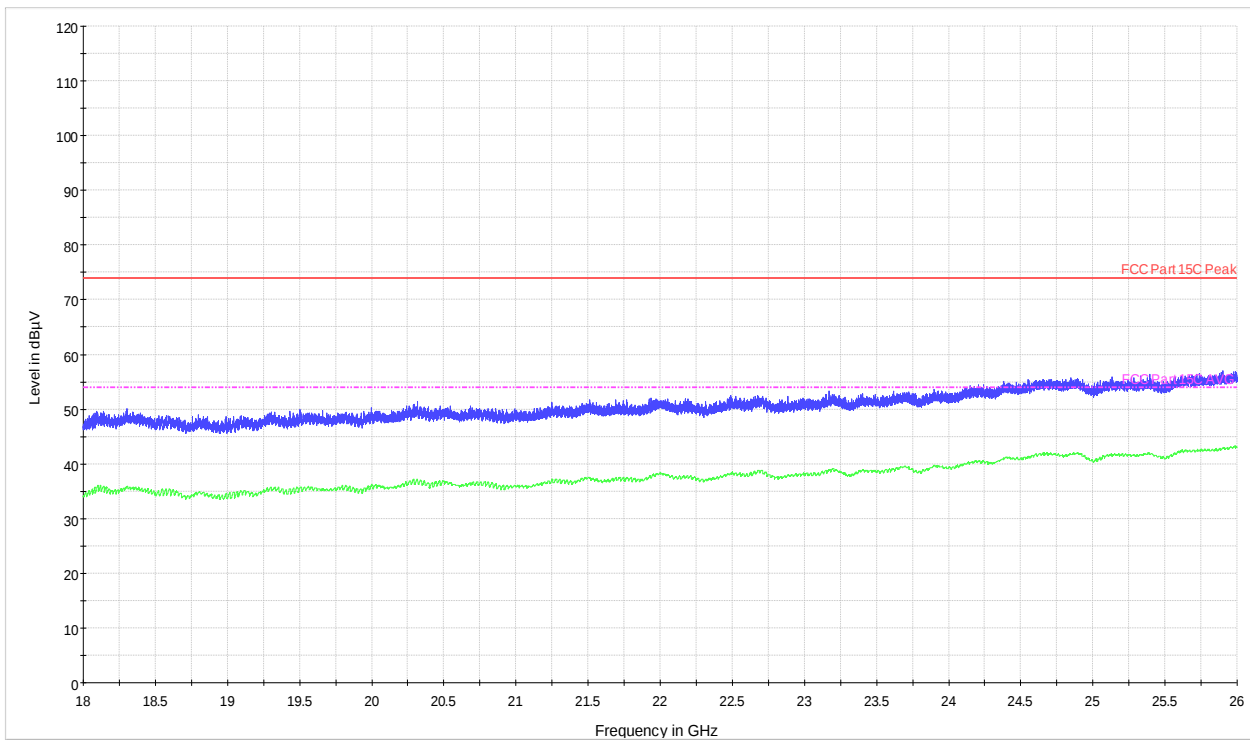
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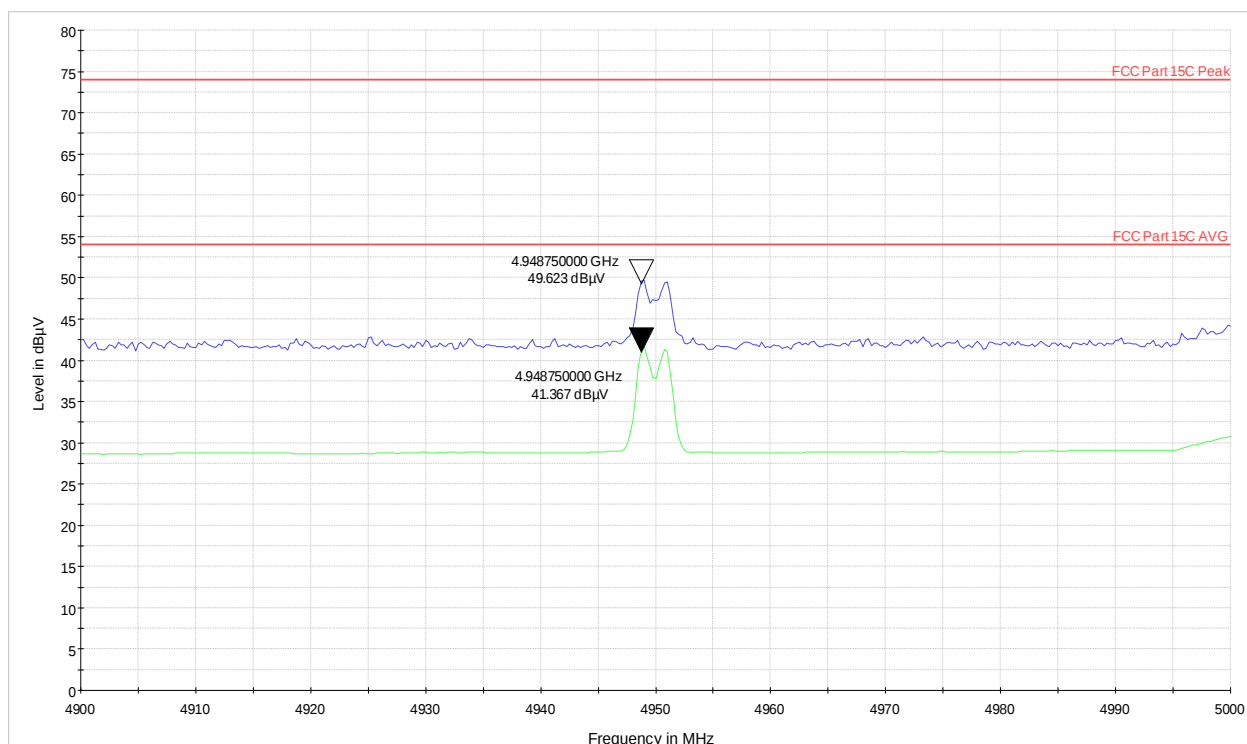
Frequency range: 18GHz to 26GHz

Polarization: Vertical



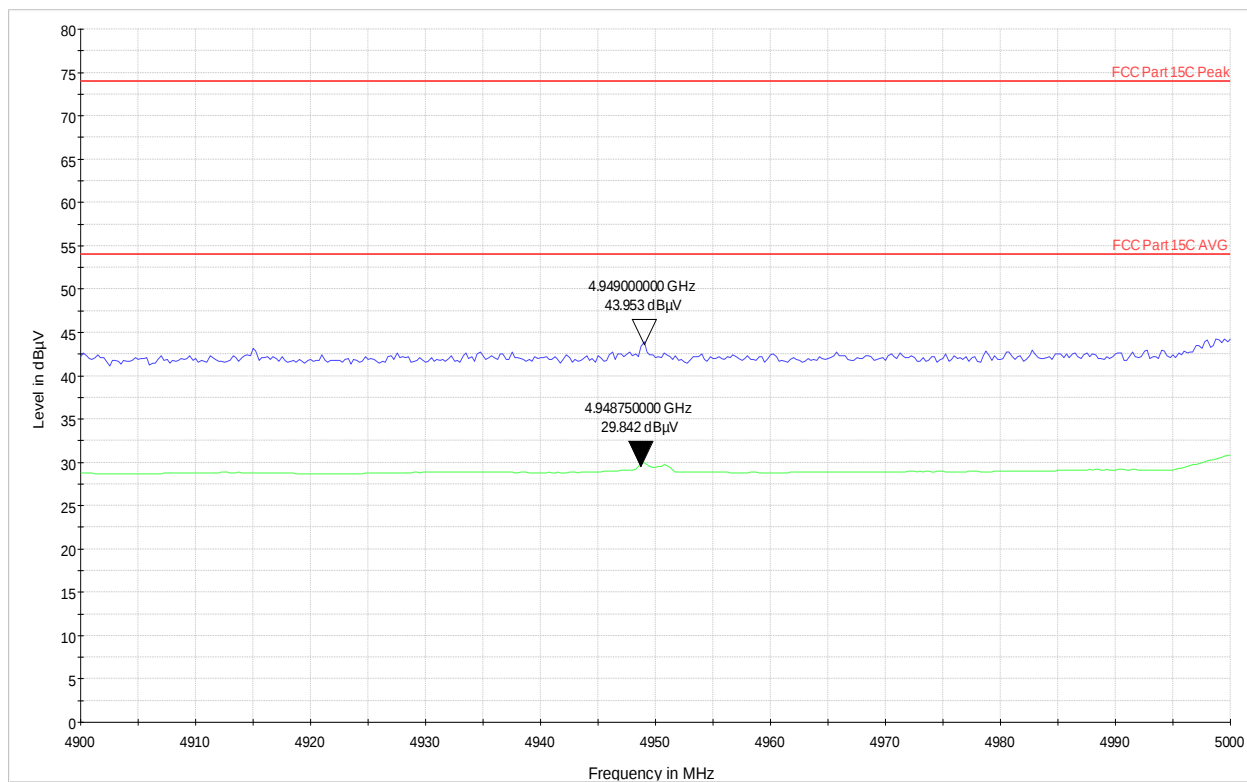
Frequency range: 18GHz to 26GHz

Polarization: Horizontal



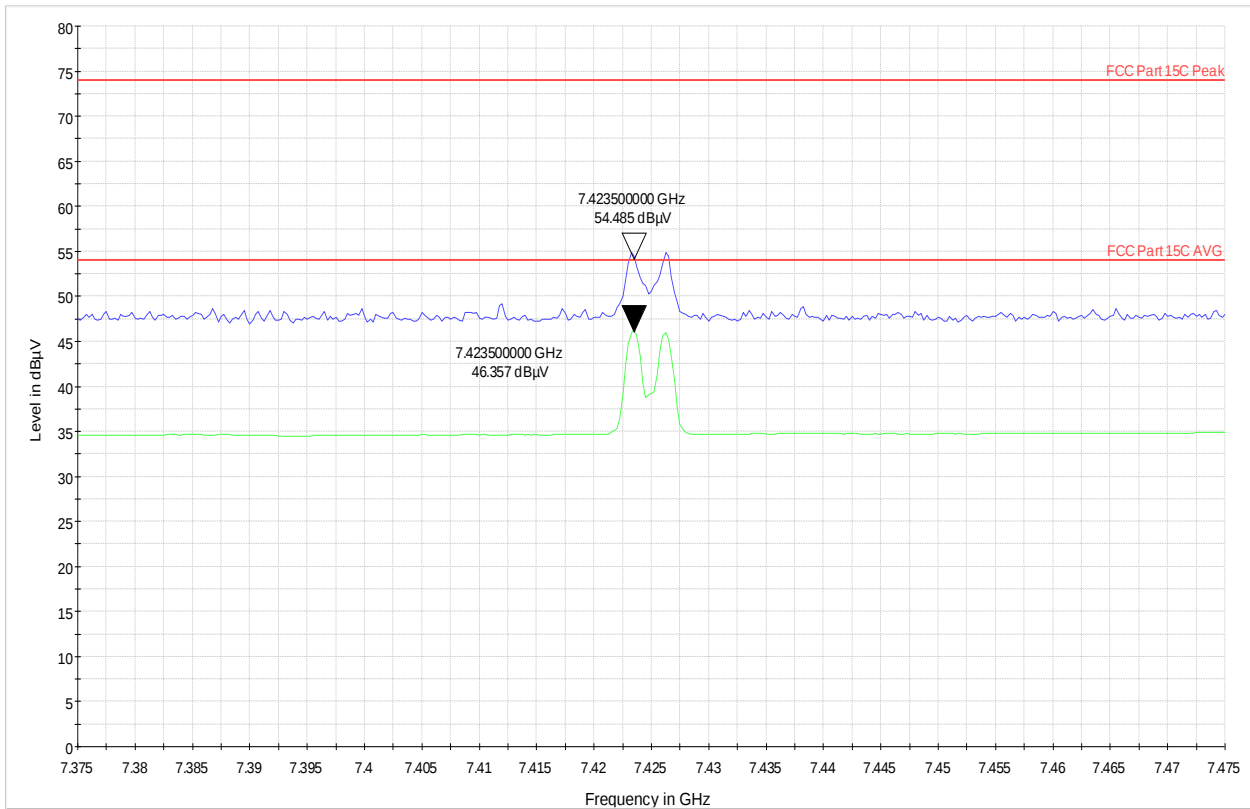
Channel Frequency: 2nd Harmonics

Polarization: Vertical



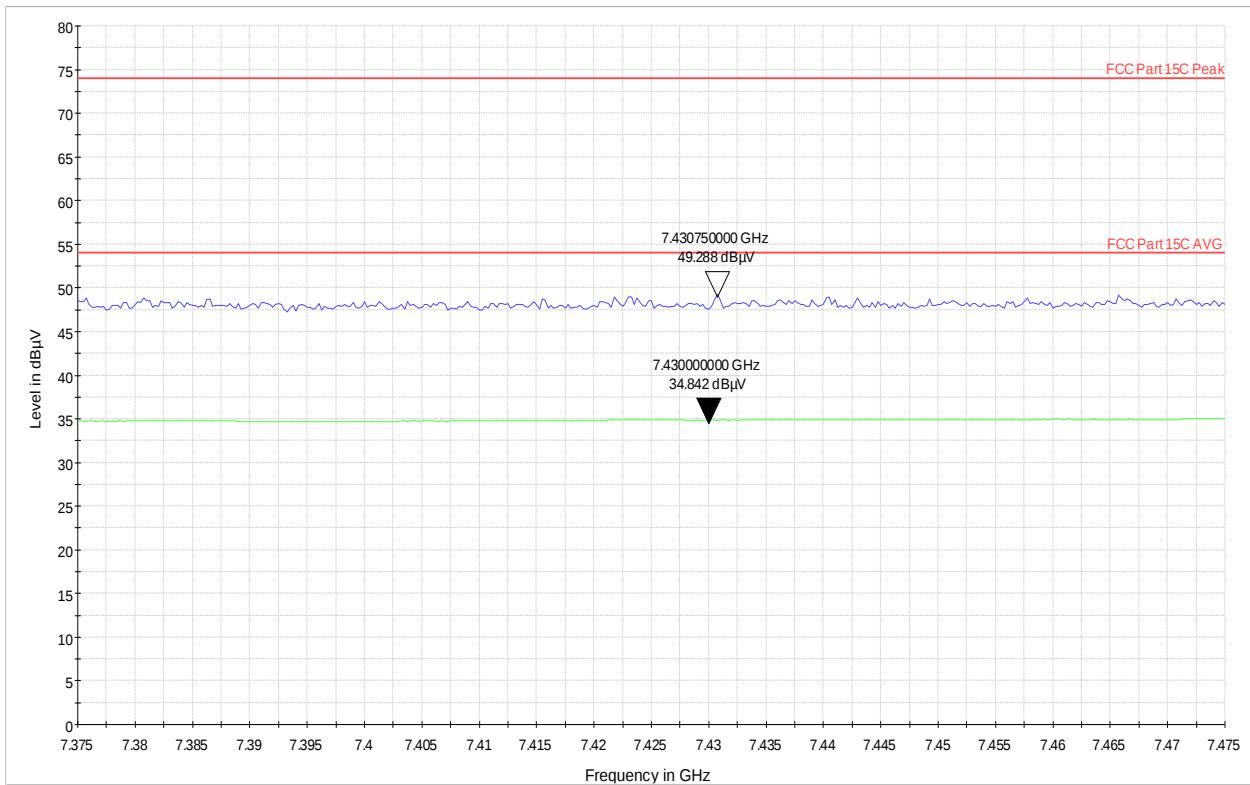
Channel Frequency: 2nd Harmonics

Polarization: Horizontal



Channel Frequency: 3rd Harmonics

Polarization: Vertical



Channel Frequency: 3rd Harmonics

Polarization: Horizontal

9 Conducted Spurious Emission Test on AC Power Line

Result

Pass

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

***Note:** The product has tested with 110VAC,60Hz power supply

Limits of section 15.207

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:

Normal Temperature = +24°C

Voltage (V norm) = 110V AC, 60Hz supply

RH = 64 %

Prüfbericht - Nr.:

Test Report No.:

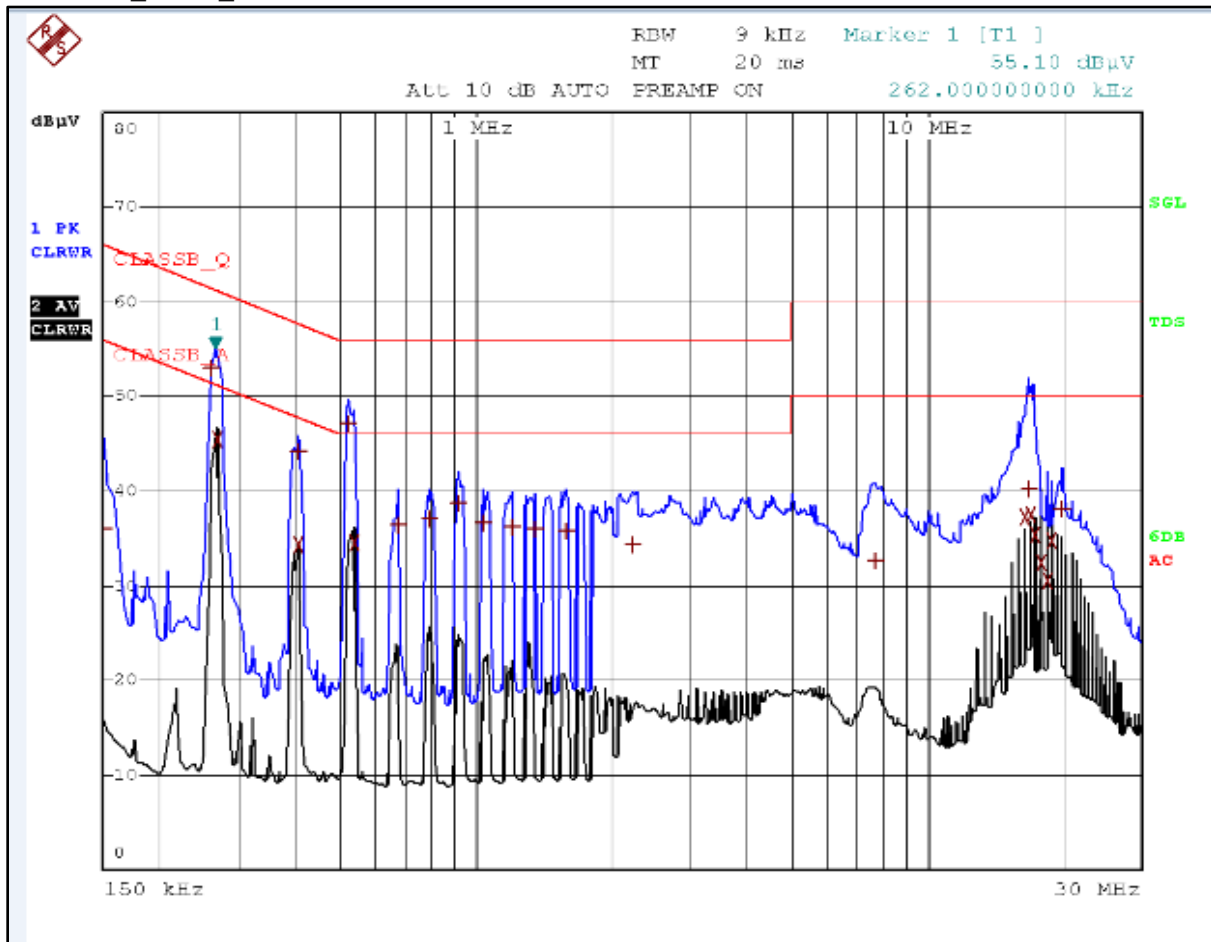
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Test result:

Power: 110VAC_60HZ_LINE



Graph: Line

EDIT PEAK LIST (Final Measurement Results)				
Trace1:	CLASSB_Q			
Trace2:	CLASSB_A			
Trace3:	---			
TRACE	FREQUENCY	LEVEL dBμV	DELTA	LIMIT dB
2 Average	266 kHz	45.49	-5.75	
1 Quasi Peak	262 kHz	53.08	-8.28	
1 Quasi Peak	518 kHz	47.14	-8.85	
2 Average	534 kHz	34.45	-11.54	
2 Average	17.046 MHz	37.45	-12.54	
2 Average	16.546 MHz	37.19	-12.00	
2 Average	402 kHz	34.42	-13.38	
1 Quasi Peak	402 kHz	44.28	-13.53	
2 Average	17.846 MHz	35.37	-14.62	
2 Average	19.05 MHz	34.76	-15.23	
1 Quasi Peak	918 kHz	38.82	-17.17	
2 Average	18.046 MHz	32.45	-17.54	
1 Quasi Peak	786 kHz	37.11	-18.89	
2 Average	18.546 MHz	30.64	-19.35	
1 Quasi Peak	1.038 MHz	36.54	-19.45	
1 Quasi Peak	674 kHz	36.41	-19.58	
1 Quasi Peak	16.966 MHz	40.22	-19.78	
1 Quasi Peak	1.21 MHz	36.16	-19.84	
1 Quasi Peak	1.35 MHz	35.95	-20.04	
1 Quasi Peak	1.582 MHz	35.70	-20.29	

Prüfbericht - Nr.:

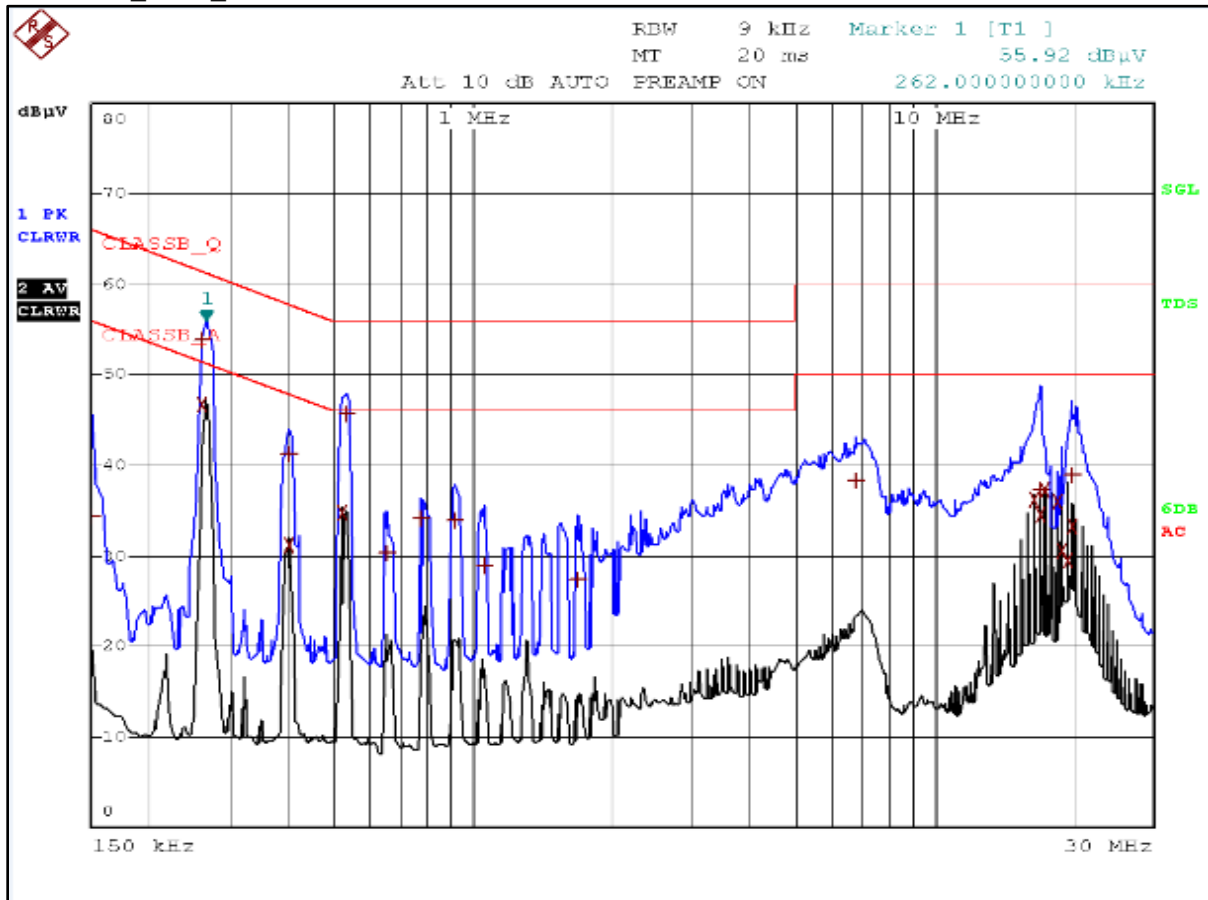
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Power: 110VAC_60HZ_NEUTRAL



Graph: Neutral

EDIT PEAK LIST (Final Measurement Results)				
Trace1:	CLASSB_Q			
Trace2:	CLASSB_A			
Trace3:	---			
TRACE	FREQUENCY	LEVEL dBμV	DELTA LIMIT dB	
2 Average	262 kHz	46.72	-4.64	
1 Quasi Peak	262 kHz	53.79	-7.57	
1 Quasi Peak	530 kHz	45.68	-10.31	
2 Average	522 kHz	34.77	-11.23	
2 Average	17.546 MHz	37.27	-12.72	
2 Average	16.542 MHz	36.25	-13.74	
2 Average	18.55 MHz	36.07	-13.92	
2 Average	17.042 MHz	34.45	-15.54	
1 Quasi Peak	398 kHz	41.31	-16.58	
2 Average	398 kHz	31.23	-16.65	
2 Average	20.05 MHz	33.24	-16.76	
2 Average	19.046 MHz	30.59	-19.40	
2 Average	19.546 MHz	29.48	-20.51	
1 Quasi Peak	20.114 MHz	38.96	-21.03	
1 Quasi Peak	6.834 MHz	38.21	-21.78	
1 Quasi Peak	774 kHz	34.19	-21.90	
1 Quasi Peak	914 kHz	33.84	-22.15	
1 Quasi Peak	17.146 MHz	37.19	-22.80	
1 Quasi Peak	650 kHz	30.29	-25.70	
1 Quasi Peak	1.058 MHz	28.83	-27.16	

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END OF TEST REPORT