

Prüfbericht-Nr.: <i>Test report no.:</i>	ULR- TC568820300000046F	Auftrags-Nr.: <i>Order no.:</i>	166478477 0010	Seite 1 von 52 Page 1 of 52
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	NA	Auftragsdatum: <i>Order date:</i>	2020-09-03	
Auftraggeber: <i>Client:</i>	Parkquility, Inc. 3155 Frontera Way, Burlingame, CA 94010			
Prüfgegenstand: <i>Test item:</i>	PQ Ground Sensor			
Bezeichnung / Serien -Nr.: <i>Identification / Serial no.:</i>	Sensor P/20IN0800028			
Auftrags-Inhalt: <i>Order content:</i>	Testing & issue of test report			
Prüfgrundlage: <i>Test specification:</i>	FCC Part 15 Subpart C 15.247			
Wareneingangsdatum: <i>Date of sample receipt:</i>	2020-09-08			
Prüfmuster-Nr.: <i>Test sample no.:</i>	A002905436-001 A002905436-004			
Prüfzeitraum: <i>Testing period:</i>	2020-09-08 - 2020-09-11			
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, ElectronicCityPhase1 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>	2020-11-17	Ausstellatum: <i>Issue date:</i>	2020-11-17	
Stellung / Position:	Madhu Karadekere Nagaraju Senior Engineer	Stellung / Position:	Mahammadgouse Kaladagi Assistant Manager	
Sonstiges / Other:	ULR – TC5688-20300000046F FCC ID: 2AXL5-PQR02			
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 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	FCC	Result
Maximum conducted (Peak) output power	15.247 (b)(2)	Pass
Occupied bandwidth	15.247 (a) (i)	Pass
Number of Hopping channels	15.247 (a) (i)	Pass
Carrier Frequency Separation	15.247 (a) (1)	Pass
Time of Occupancy (Dwell Time)	15.247 (a) (i)	Pass
Emissions in non-restricted frequency bands	15.247 (d)	Pass
Spurious Radiated Emissions and Restricted Bands of Operation	FCC 15.209 / FCC 15.205	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-TC568820300000046F	01	Initial issue of report	2020-11-05
ULR-TC568820300000046F	02	Reviewer comments updated	2020-11-17

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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 DIAGRAMS
8. BILL OF MATERIAL
9. USER MANUAL
10. Maximum Permissible Exposure Information

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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
Active loop antenna	Schwarzbeck	FMZB 1519 B	1519B-00111	-	31.01.2021	Yearly	Radiated Spurious Emission
Biconical Antenna	Schwarzbeck	VHBB91 24+BBA 9106	9124-1208+9106-0525	-	16.01.2021	Yearly	
Baloon and Biconical Antenna	Schwarzbeck mess-elektronik	VHBB-9124 / BBA-9106	01028	-	16.01.2021	Yearly	
Log - Periodical Antenna	Schwarzbeck	VUSLP 9118 A	VULP9118A-0733	-	17.01.2021	Yearly	
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA 9170-0904	-	29.01.2021	Yearly	
Horn Antenna	Schwarzbeck	BBHA 9120 D	9120D-1944	-	30.01.2021	Yearly	
Semi Anechoic Chamber	Frankonia	-	-	-	-	-	
Fully Anechoic Chamber	Albatross	-	-	-	-	-	
EMI Receiver	Rohde & Schwarz	ESW 44	101732	-	10.12.2020	Yearly	Antenna-Port Conducted test
Spectrum Analyser	Rohde & Schwarz	FSV7	101644	FW 3.40	27.12.2020	Yearly	
Spectrum Analyser	Agilent Technologies	E4407B	US41192772	A.14.06	10.08.2021	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

The Parking Sensor Devices are used for identifying the cars parked in the parking space. It also helps the user parked on the spot to connect with the sensor using the smartphone with Bluetooth and verify the parking. The devices will be used to

- Guide the user to the parking spaces, helping them save time and reduce traffic congestion
- Provide intelligence to cities and parking operators on occupancy and parking spaces, helping them maximize the revenue.

3.2 Ratings and System Details of Equipment under Test

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

Protocol	Sub GHz
Operating Frequency Range	902.2MHz to 927MHz
No. of Channels	125 (Refer Table 5)
Channel Spacing	200KHz
Maximum Measured Power (e.i.r.p)	15.93 dBm(915 MHz)
Modulation	2-GFSK
Number of antennas	1
Antenna Gain	4.85 dBi
Antenna Type	Monopole PCB Antenna Dual Band Option
Supply Voltage to Product	6V DC Supply
Environmental conditions	-40°C to +85°C
EUT Dimension	120 x 120 x 25 mm (LxWxH)

***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.

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Note: Product Parkquility Parking Sensor 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.

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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: PQR02

Software Version: Version1

4.3 Special Accessories and Auxiliary Equipment

- Test laptop and USB cable

4.4 Countermeasures to achieve EMC Compliance

- None

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4.5 List of frequencies

Frequency Band (GHz)	Channel No.	Frequency (MHz)
Sub-GHz (902.2 MHz – 927 MHz)	Low	902.2
	:	:
	Mid	915
	:	:
	High	927

Table 5: List of SubGHz Center frequencies

Channel used for SubGHz testing

Channel low : 902.2MHz

Channel mid : 915MHz

Channel High : 927MHz

Note:

TUV Sample Identification number : A002905436-001 – Radiated test Sample
A002905436-004 – Conducted test Sample

4.6 Report references

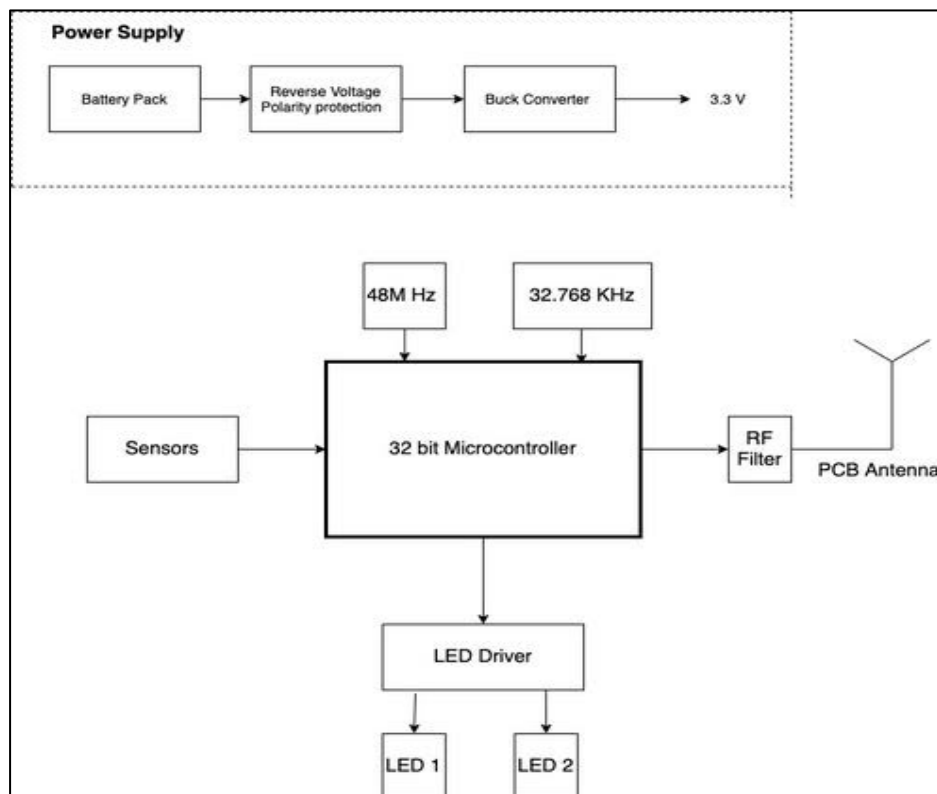
Note: Product Parkquility Parking Sensor has multiple protocols. All the supported wireless protocols and their respective test results are issued in separate test reports, following table lists the report numbers.

Radio Protocol	Report Number
RF test report for BLE (2.4GHz)	ULR-TC568820300000045F
Sub GHz(902.2MHz – 927MHz) – This Report	ULR-TC568820300000046F

5 Operational Description

The device can operate at various frequency bands. The device is designed with a PCB antenna, which can operate in two different modes. When configured as Single Band Mode, this is ideal for 915 MHz band operation. The antenna can also be configured in Dual Band Mode then the operation can also be at 915 MHz and 2.4 GHz.

6 Block Diagram



7 TEST METHODOLOGY

7.1 Radiated Emission Test

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

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

7.1.1 Test Setup Configuration

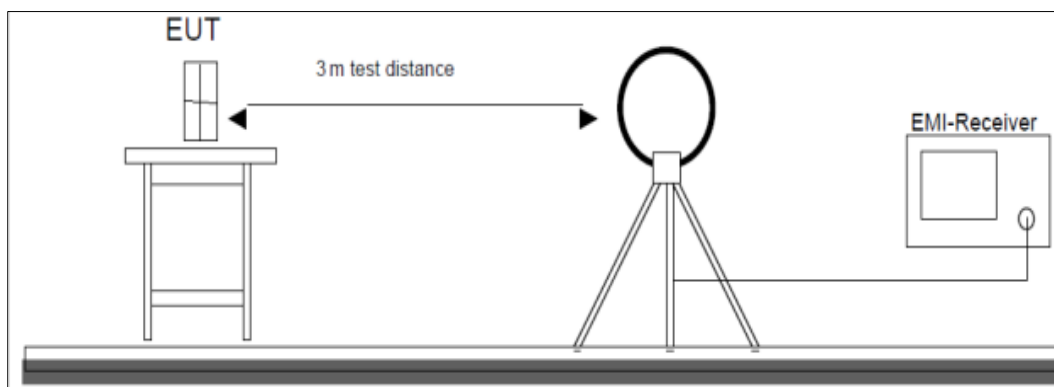


Figure 1: Frequency Range 9 kHz- 30 MHz

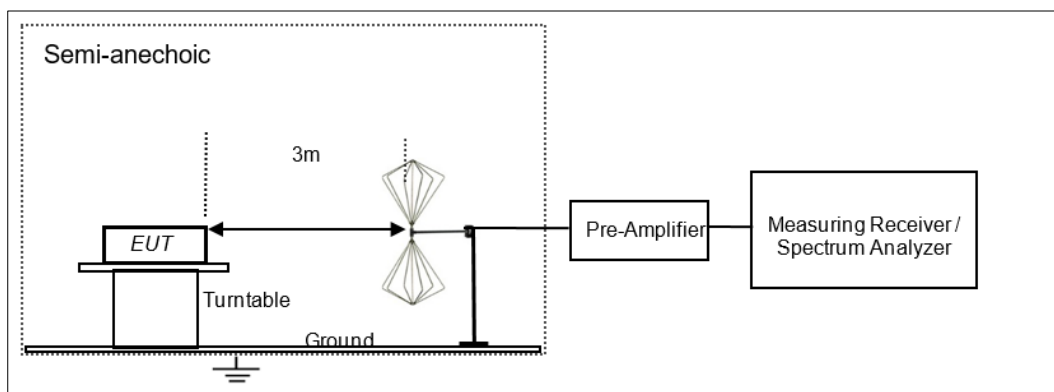


Figure 2: Frequency Range 30 MHz – 200 MHz

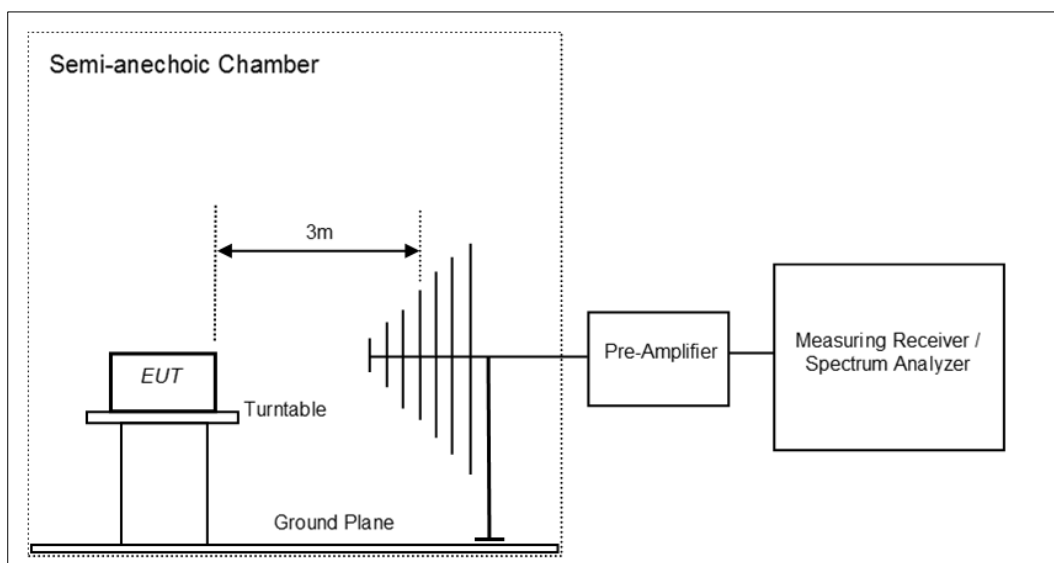


Figure 3: Frequency Range 200 MHz - 1GHz

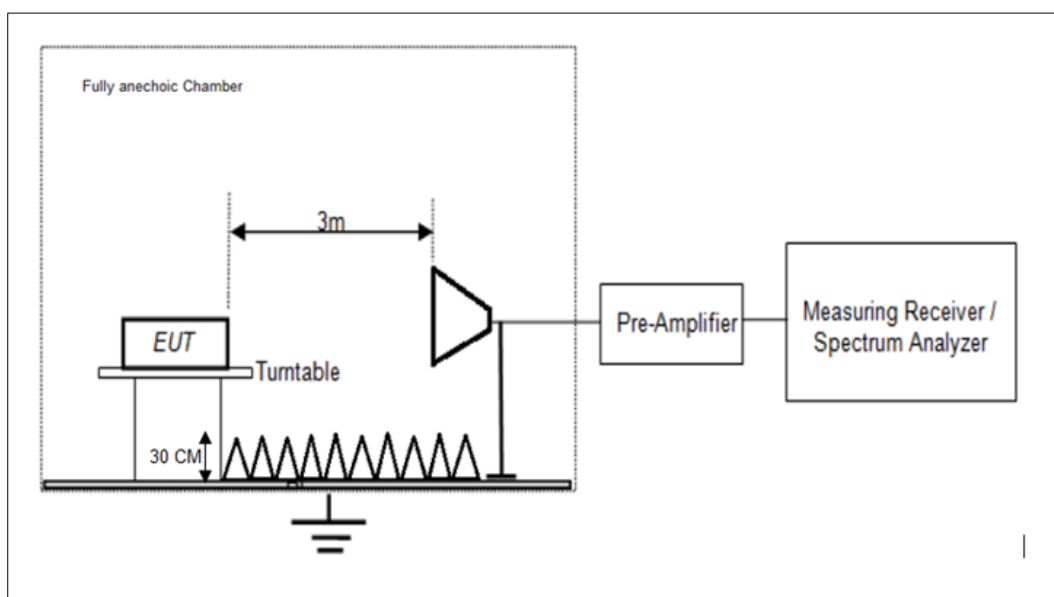


Figure 4: Frequency Range above 1 GHz

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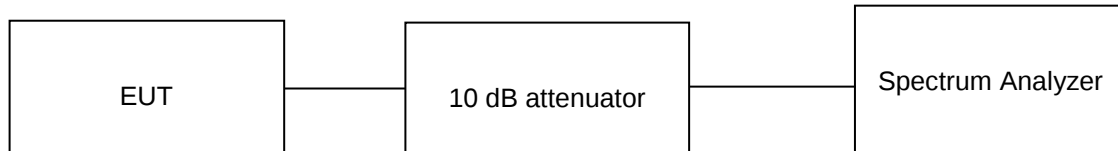
8 TEST RESULTS FOR Sub GHz

8.1 Maximum Peak Conducted Output Power

Result

Pass

Test Specification	FCC part 15 Subpart C 15.247 (b)(2)
Test Method	Subclause 7.8.5 of ANSI C63.10
Measurement Bandwidth	300kHz
Detector	Peak
Port of testing	Antenna port
Requirement	Power $\leq$ 1 W (30 dBm)



Test Condition

Normal Test Condition:

Temperature (Norm) = + 23.5 °C Voltage = 6V DC Supply Relative humidity: 63%

KDB Guidelines applied:

Measurements were made as per section 9(b) in KDB 558074 D01 15.247 Measurement Guidance v05r02.

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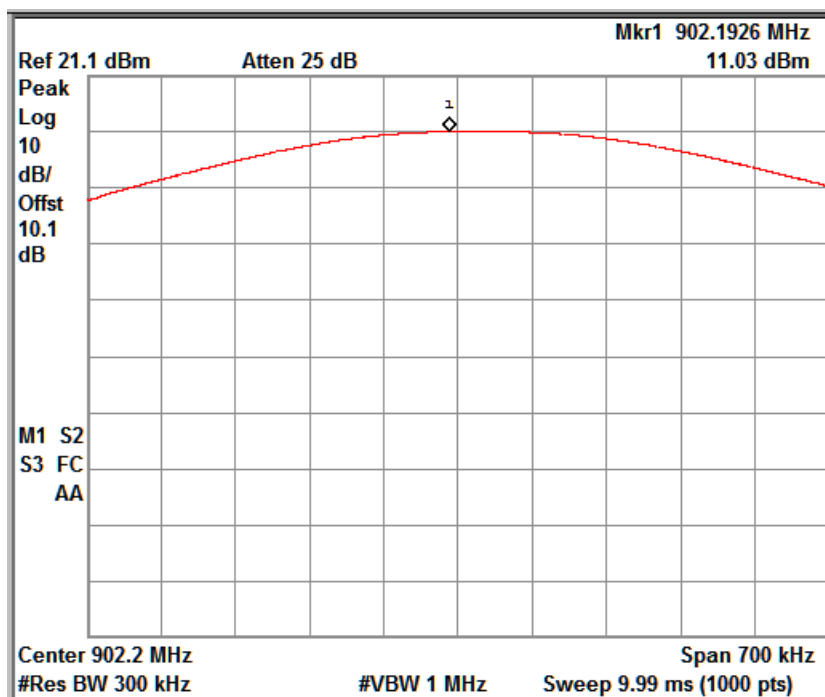
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Test results:

Note:

1. All the losses are included during measurement and final values are mentioned in the test report.
2. Total Peak Output power (dBm) = Measured Peak power (dBm) + Attenuator factor (10dB) + Cable loss (0.1dB)
3. This product do not support additional beamforming gain / directional gain, it uses signal antenna and hence directional gain of the single antenna is 4.85 dBi

Data Rate (kbps)	Channel Frequency (MHz)	Maximum Peak Conducted Output Power (dBm)	Power Limit (dBm)
50	902.2	11.03	30
	915.0	11.08	30
	927.0	10.96	30

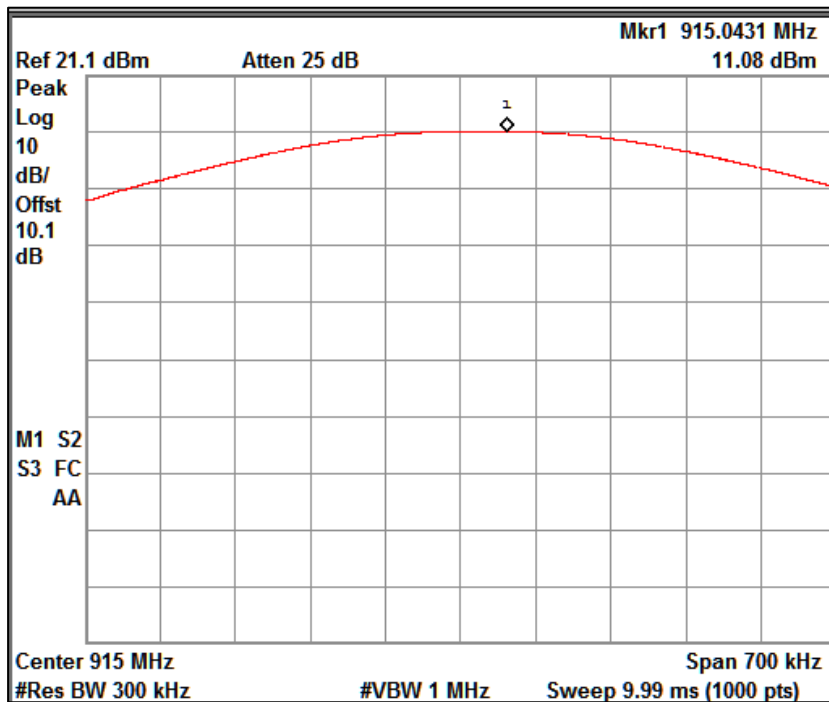


Channel Frequency:902.2MHz

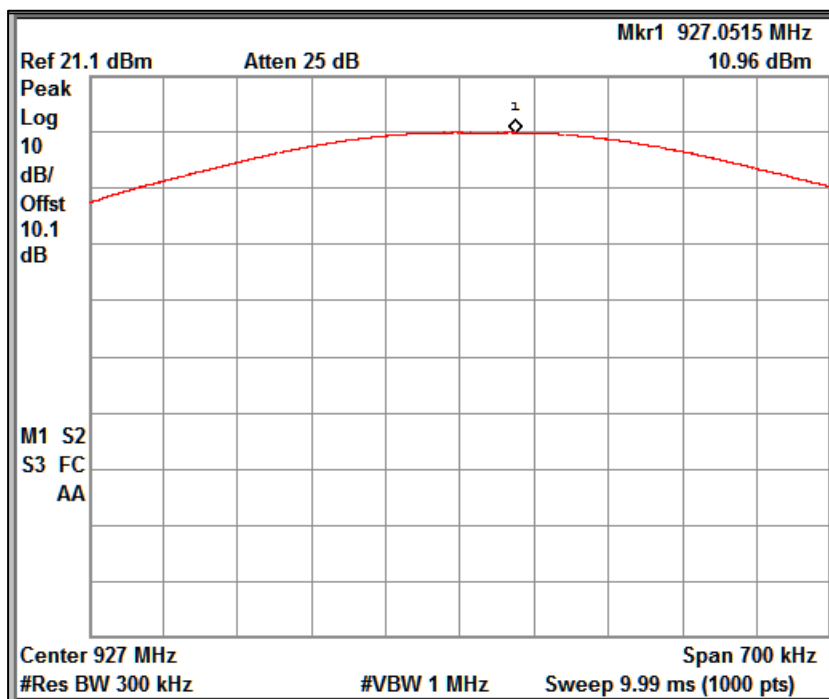
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Channel Frequency: 915MHz



Channel Frequency: 927MHz

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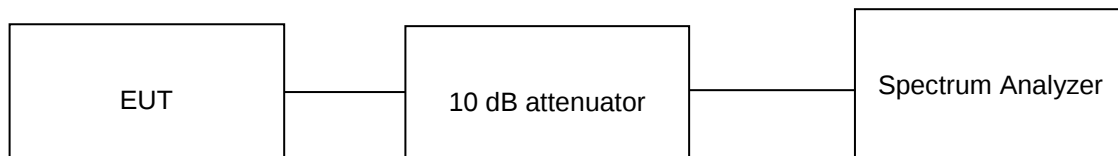
8.2 Occupied bandwidth

Result

Pass

Test Specification	FCC part 15 Subpart C 15.247 (a) (i)
Test Method	Subclause 7.8.7 of ANSI C63.10
Measurement Bandwidth	30 kHz
Detector	Peak
Port of testing	Antenna port
Requirement	The minimum 20 dB bandwidth of the hopping channel is 250 kHz use at least 50 hopping frequencies.

Test Method:



Test Condition

Normal Test Condition:

Temperature (Norm) = + 23.5 °C Voltage = 6V DC Supply Relative humidity: 63%

KDB Guidelines applied:

Measurements were made as per section 9(b) in KDB 558074 D01 15.247 Measurement Guidance v05r02.

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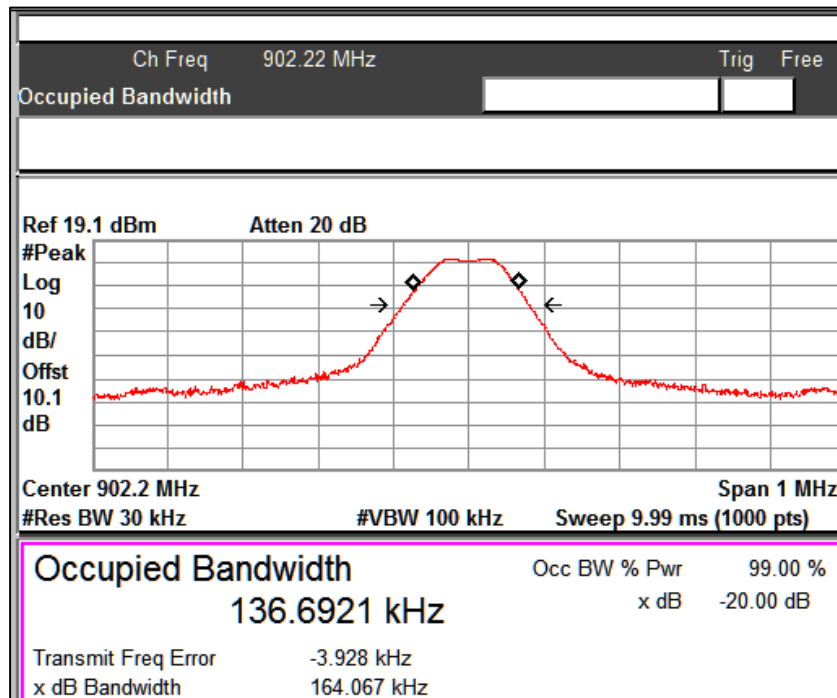
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Test results:

Note:

1. All the losses are included during measurement and final values are mentioned in the test report.
2. Total Peak Output power (dBm) = Measured Peak power (dBm) + Attenuator factor (10dB) + Cable loss (0.1dB)
3. This product do not support additional beamforming gain / directional gain, it uses signal antenna and hence directional gain of the single antenna is 4.85 dBi

Data Rate (kbps)	Channel Frequency (MHz)	20 dB Bandwidth (kHz)	99% OBW (kHz)	Minimum Limit (kHz)
50	902.2	164.06	136.69	250
	915.0	166.94	138.59	250
	927.0	166.94	136.84	250

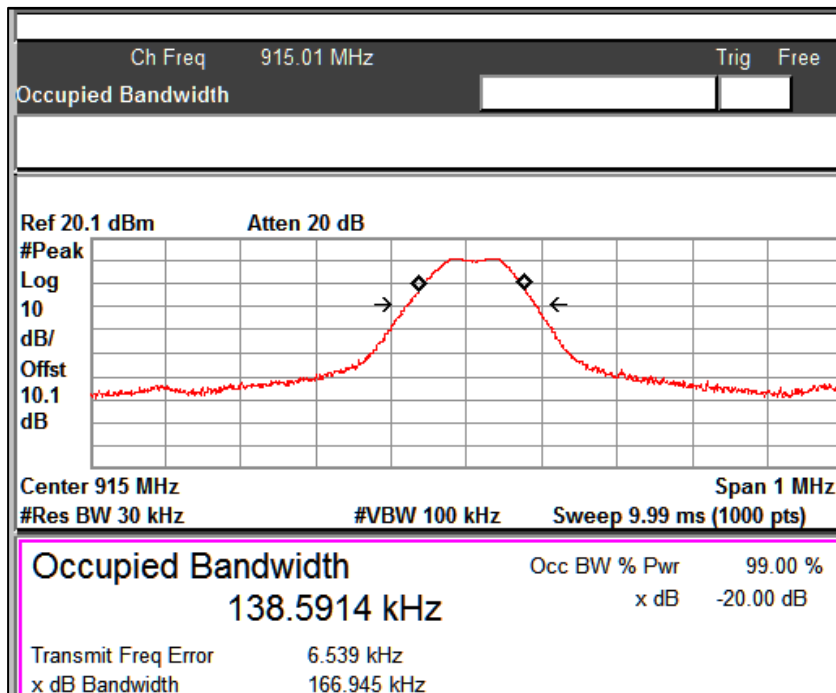


Channel Frequency: 902.2MHz

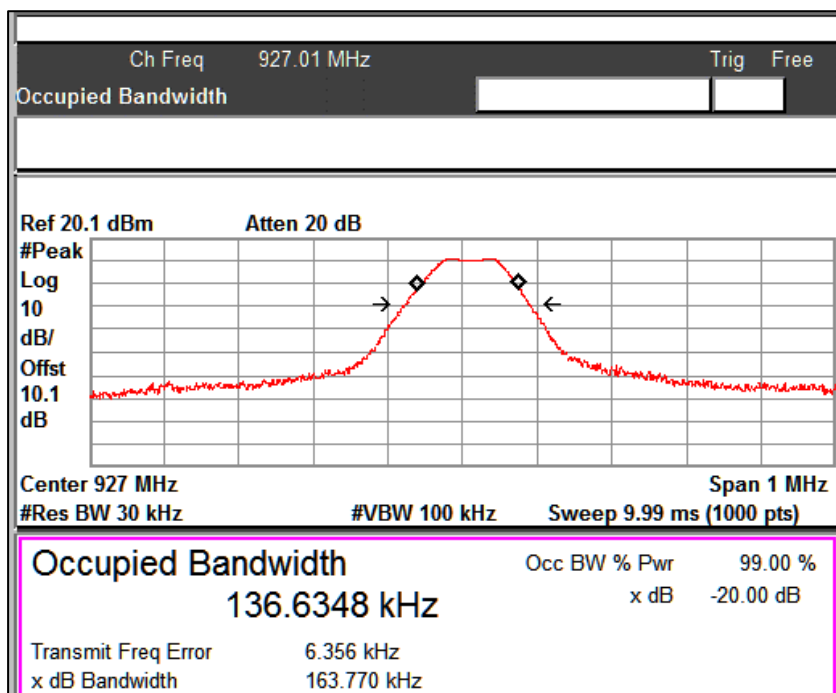
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Channel Frequency: 915MHz



Channel Frequency: 927MHz

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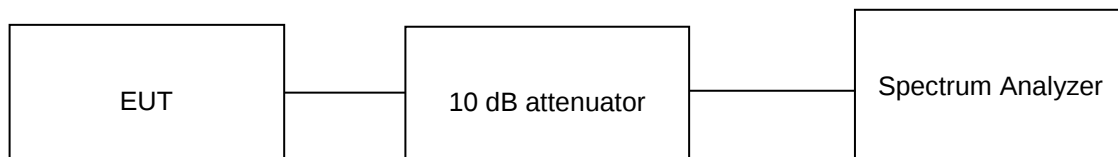
8.3 Number of Hopping Channels

Result

Pass

Test Specification	FCC Part 15 Subpart C Section 15.247 (a) (i)
Test Method	Subclause 7.8.3 of ANSI C63.10
Measurement Bandwidth	100 kHz
Detector	Peak
Port of testing	Antenna port
Requirement	Frequency hopping systems operating in the band 902-928 MHz shall use at least 50 hopping channels if the minimum 20 dB bandwidth is less than 250 kHz.

Test Method:



Test Condition

Normal Test Condition:

Temperature (Norm) = + 23.5 °C Voltage = 6V DC Supply Relative humidity: 63%

KDB Guidelines applied:

Measurements were made as per section 9(b) in KDB 558074 D01 15.247 Measurement Guidance v05r02.

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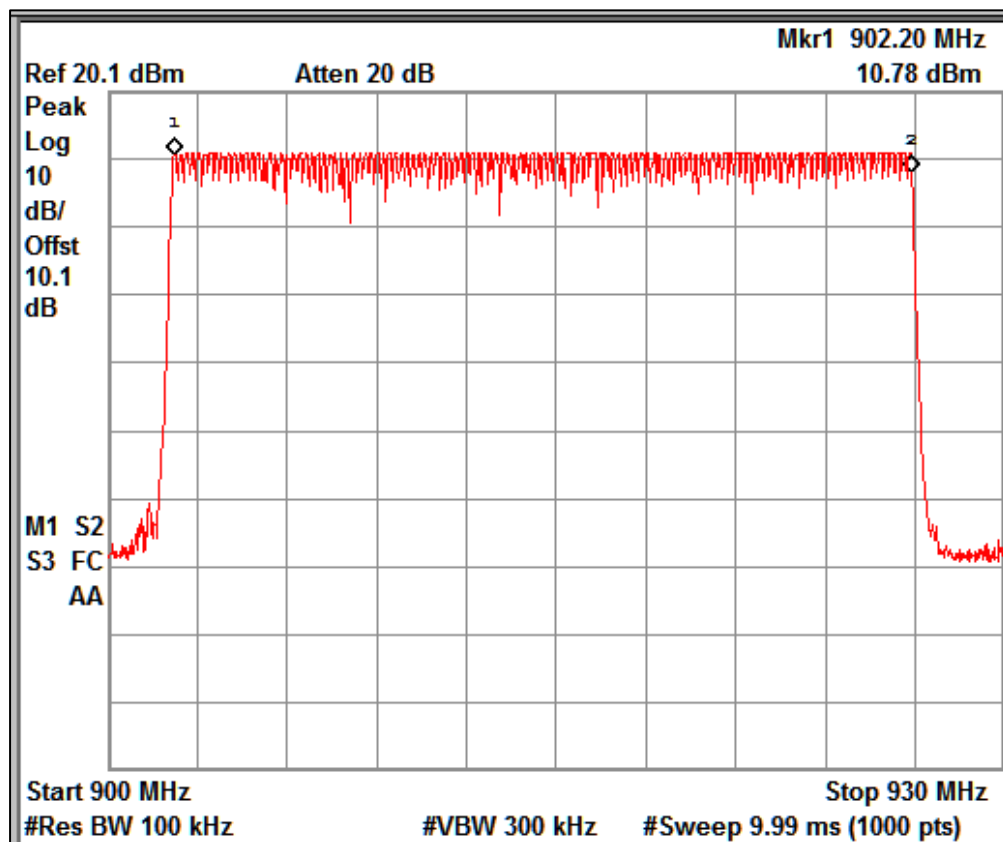
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Test results:

Note:

1. All the losses are included during measurement and final values are mentioned in the test report.
2. Total Peak Output power (dBm) = Measured Peak power (dBm) + Attenuator factor (10dB) + Cable loss (0.1dB)
3. This product do not support additional beamforming gain / directional gain, it uses signal antenna and hence directional gain of the single antenna is 4.85 dBi



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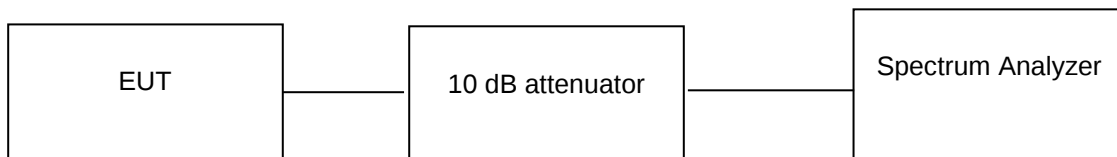
8.4 Carrier Frequency Separation

Result

Pass

Test Specification	FCC Part 15 Subpart C Section 15.247 (a) (1)
Test Method	Clause 7.8.2 of ANSI C63.10
Measurement Bandwidth	30 kHz
Detector	Peak
Port of testing	Antenna port
Requirement	Frequency hopping systems shall have hopping channel carrier frequency separated by a minimum of 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater.

Test Method:



Test Condition

Normal Test Condition:

Temperature (Norm) = + 23.5 °C Voltage = 6V DC Supply Relative humidity: 63%

KDB Guidelines applied:

Measurements were made as per section 9(b) in KDB 558074 D01 15.247 Measurement Guidance v05r02.

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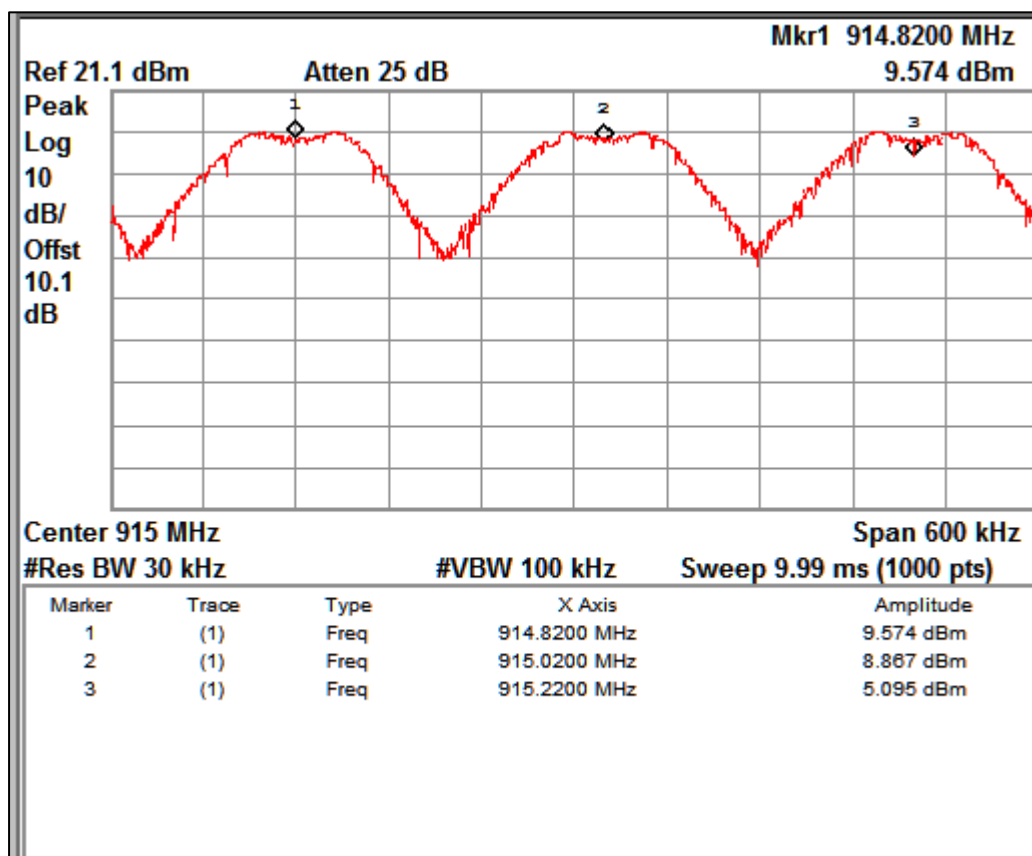
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Test results:

Note:

1. All the losses are included during measurement and final values are mentioned in the test report.
2. Total Peak Output power (dBm) = Measured Peak power (dBm) + Attenuator factor (10dB) + Cable loss (0.1dB)
3. This product do not support additional beamforming gain / directional gain, it uses signal antenna and hence directional gain of the single antenna is 4.85 dBi



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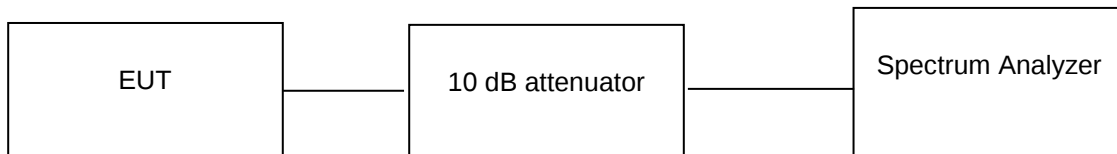
8.5 Time of Occupancy (Dwell Time)

Result

Pass

Test Specification	FCC Part 15 Subpart C Section 15.247 (a) (i)
Test Method	Clause 7.8.4 of ANSI C63.10
Measurement Bandwidth	100 kHz
Detector	Peak
Port of testing	Antenna port
Requirement	If the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period.

Test Method:



Test Condition

Normal Test Condition:

Temperature (Norm) = + 23.5 °C Voltage = 6V DC Supply Relative humidity: 63%

KDB Guidelines applied:

Measurements were made as per section 9(b) in KDB 558074 D01 15.247 Measurement Guidance v05r02.

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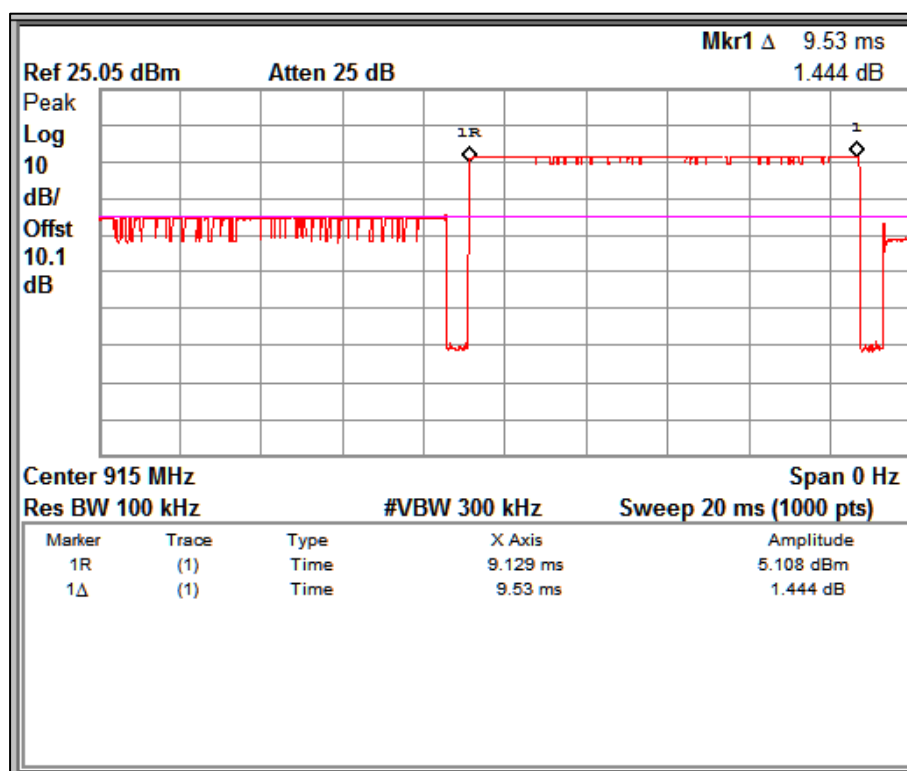
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Test results:

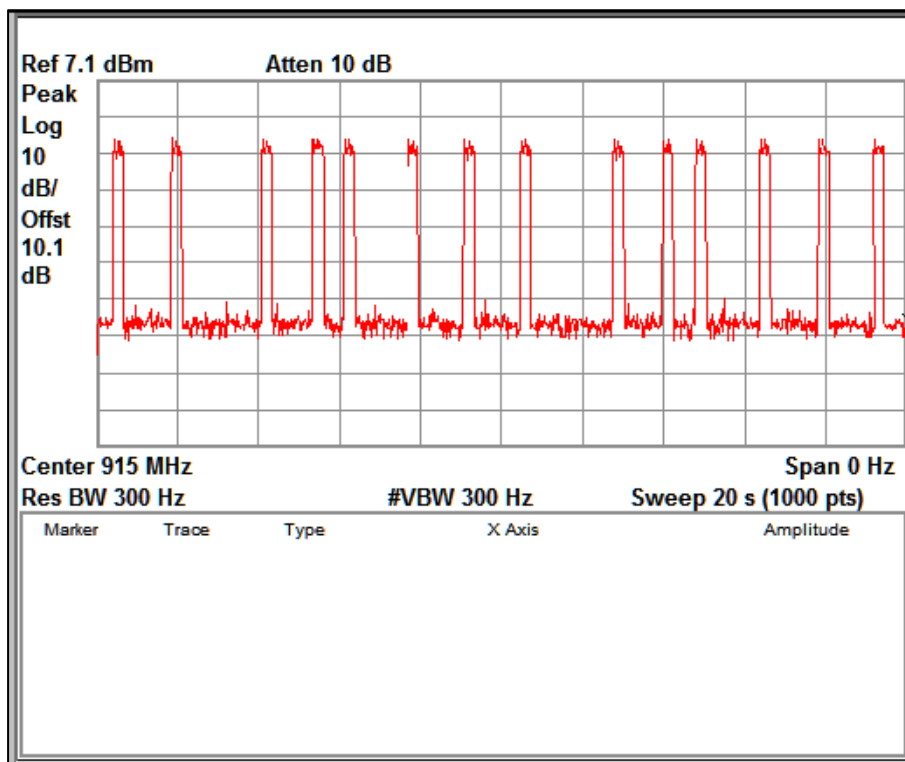
Note:

1. All the losses are included during measurement and final values are mentioned in the test report.
2. Total Peak Output power (dBm) = Measured Peak power (dBm) + Attenuator factor (10dB) + Cable loss (0.1dB)
3. This product do not support additional beamforming gain / directional gain, it uses signal antenna and hence directional gain of the single antenna is 4.85 dBi

The total sweep time is $0.4(125) = 50$ seconds.



Dwell Time



Number of Bins

Dwell Time = 9.53ms
Total bins in 20 s =14
Max. Allowed time = 0.4s

Total time occupancy in 20s = $14 \times 9.53 = 133.42\text{ms}$ (less than 400ms)

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

Result

Pass

Test Specification

FCC part 15 Subpart C 15.247 (d)

Test Method

Subclause 7.8.8 of ANSI C63.10

Measurement Bandwidth

100 kHz for frequency range < 1GHz
1 MHz for Frequency range >1GHz

Detector

Peak

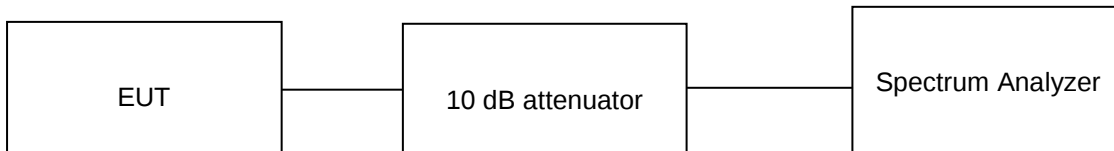
Port of testing

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) = + 23.5 °C

Voltage = 6V DC Supply

Relative humidity: 63%

KDB Guidelines applied:

Measurements were made as per section 9(b) in KDB 558074 D01 15.247 Measurement Guidance v05r02.

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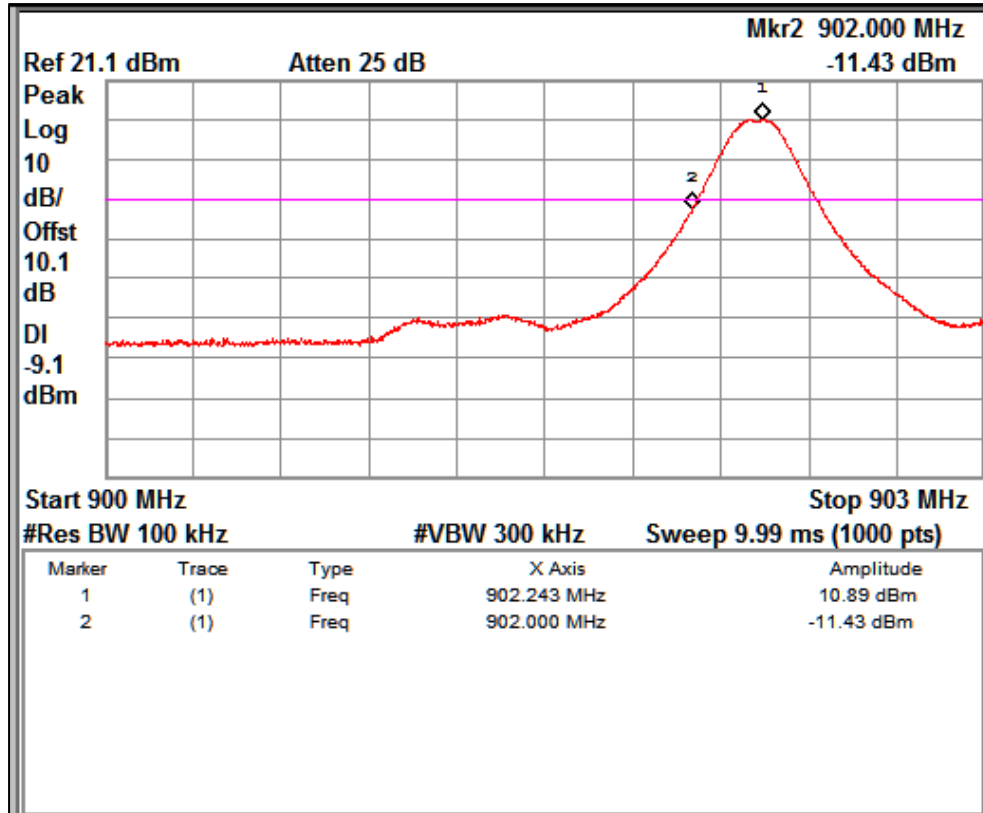
Test results:

Note:

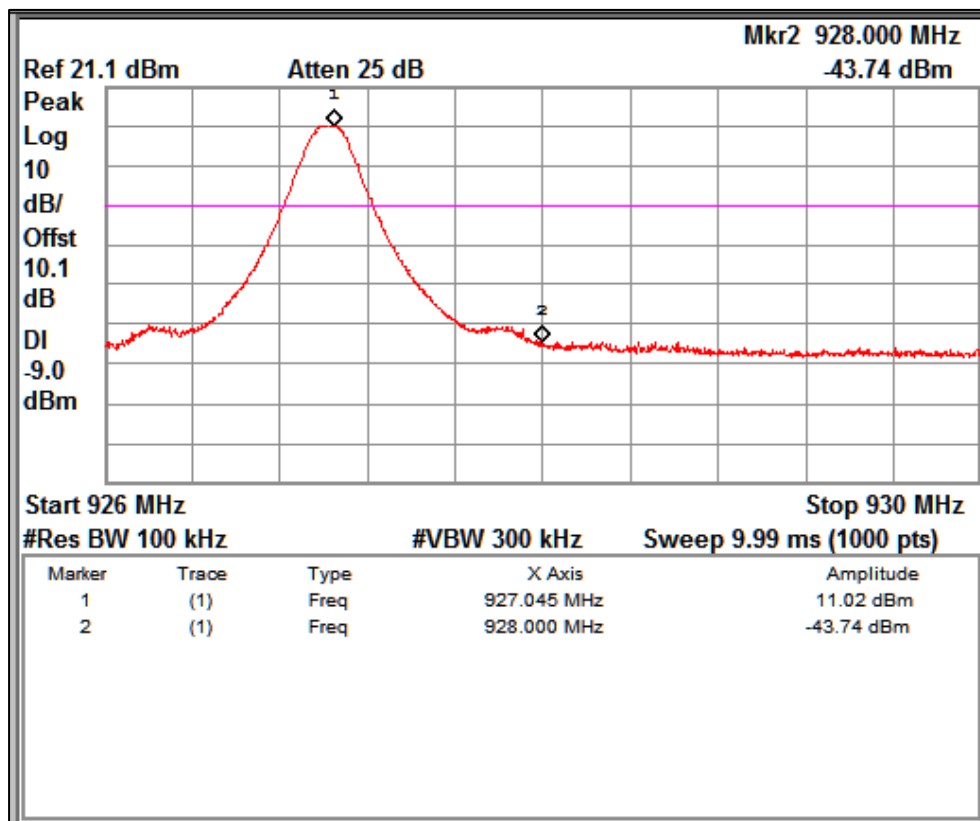
1. All the losses are included during measurement and final values are mentioned in the test report.
2. Final Value (dBm) = Measured Value (dBm) + Attenuator factor (10dB) + Cable loss (0.1dB).
3. This product do not support additional beamforming gain / directional gain, it uses signal antenna and hence directional gain of the single antenna is 4.85 dBi.
4. Testing is done for both hopping & fixed modes of operations but only worst case is reported.

8.6.1 Band edge and reference plots

Data Rate (kbps)	Channel Frequency (MHz)	Reference Value (B) (dBm)	Band edge Frequency (MHz)	Value at Band edge (A) (dBm)	A-B (dBc)	Minimum Limit (dBc)
50	902.2	10.89	902	-11.43	-22.32	-20.00
	927	11.02	928	-43.74	-54.76	-20.00

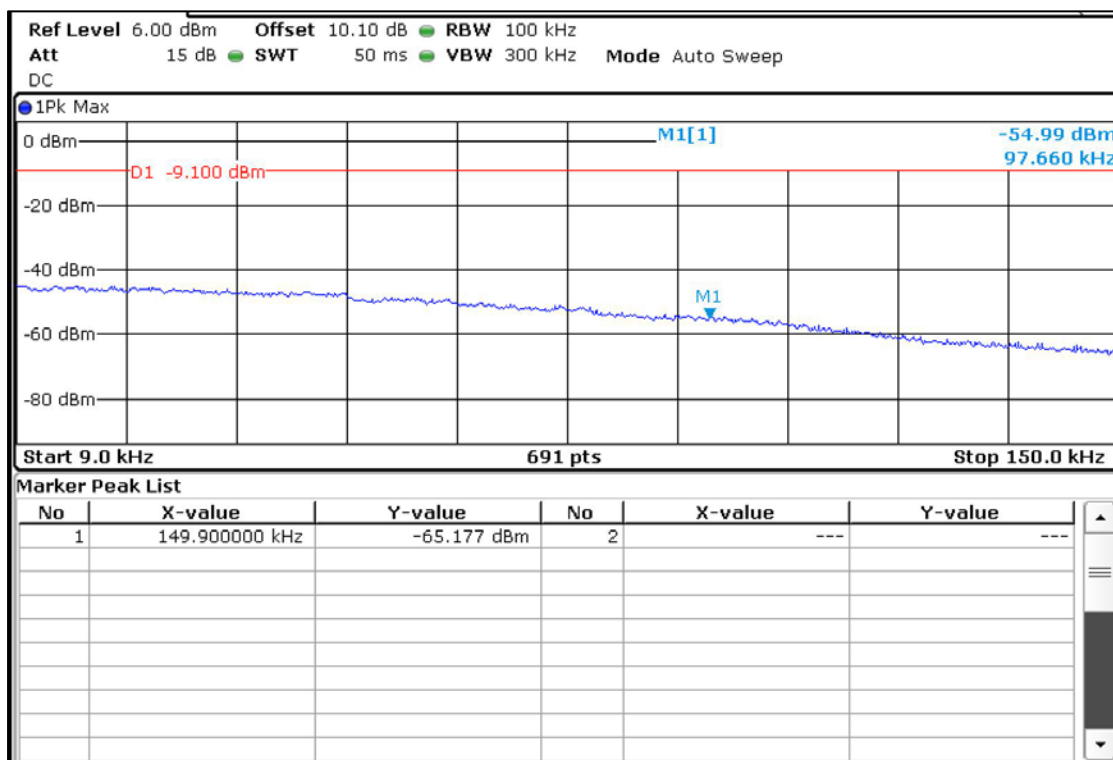


Channel Frequency 902.2MHz



Channel Frequency 927MHz

8.6.2 Out-Of-Band Emissions



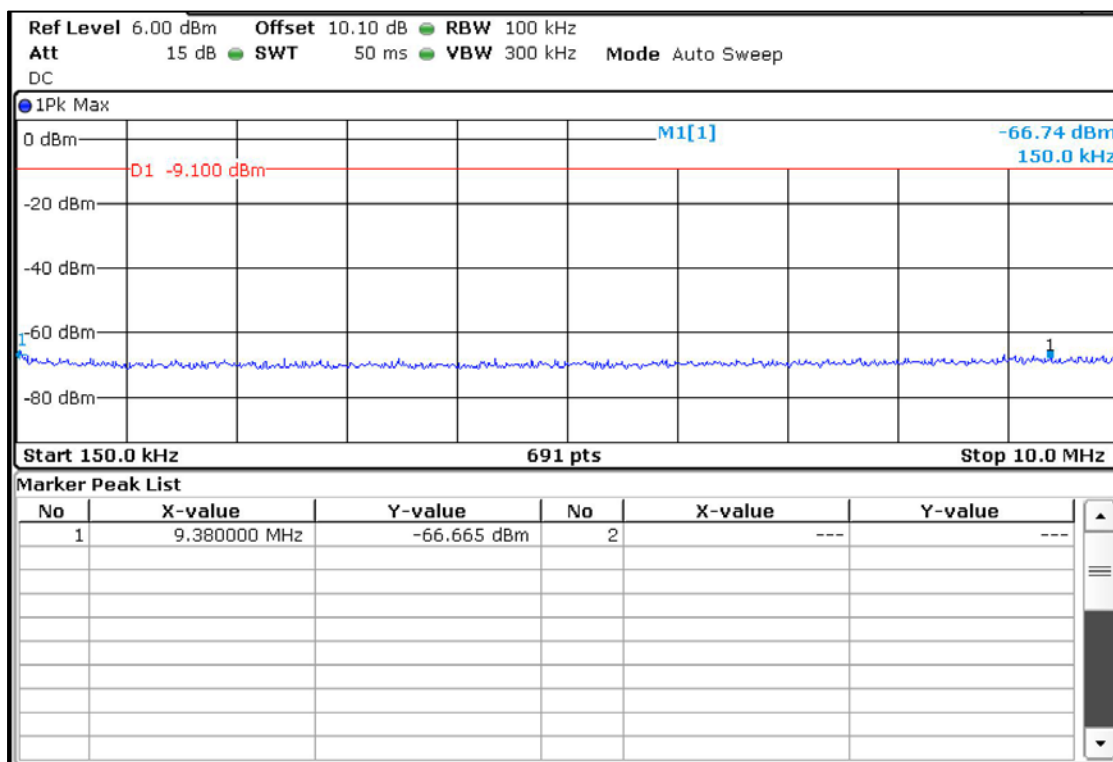
Channel Frequency 902.2MHz

Frequency Range 9KHz – 150kHz

Prüfbericht - Nr.:
Test Report No.:

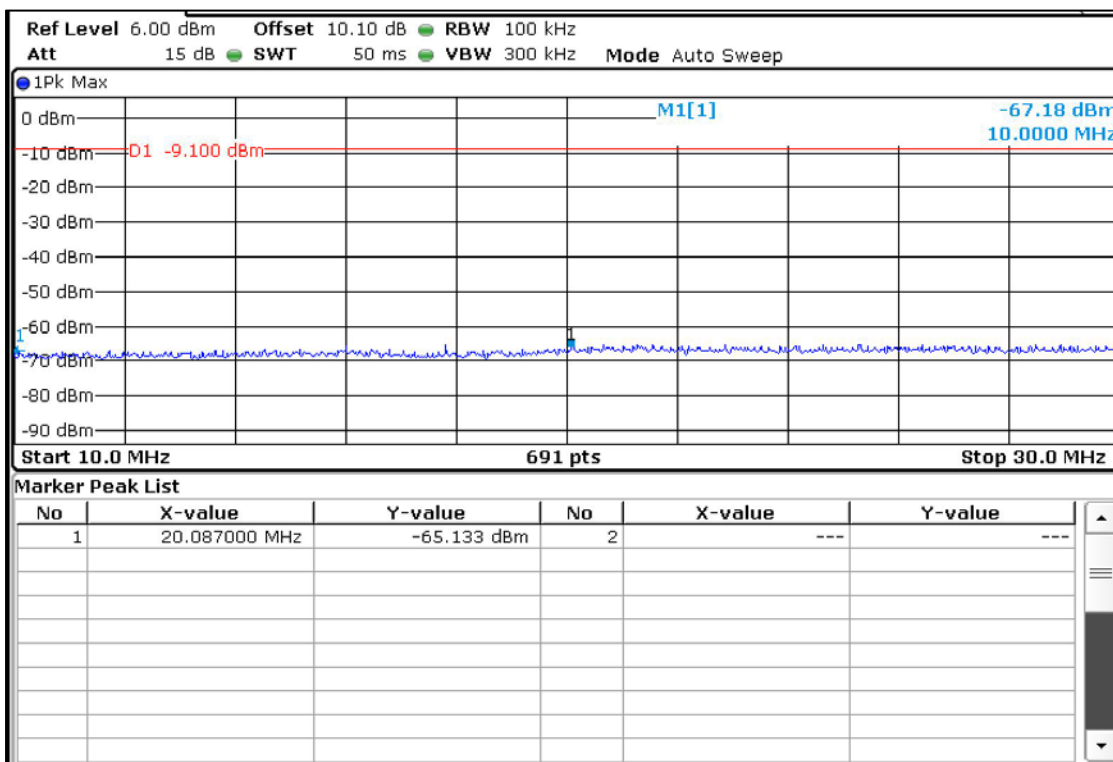
ULR-TC568820300000046F

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Channel Frequency 902.2MHz

Frequency Range 150KHz – 10MHz



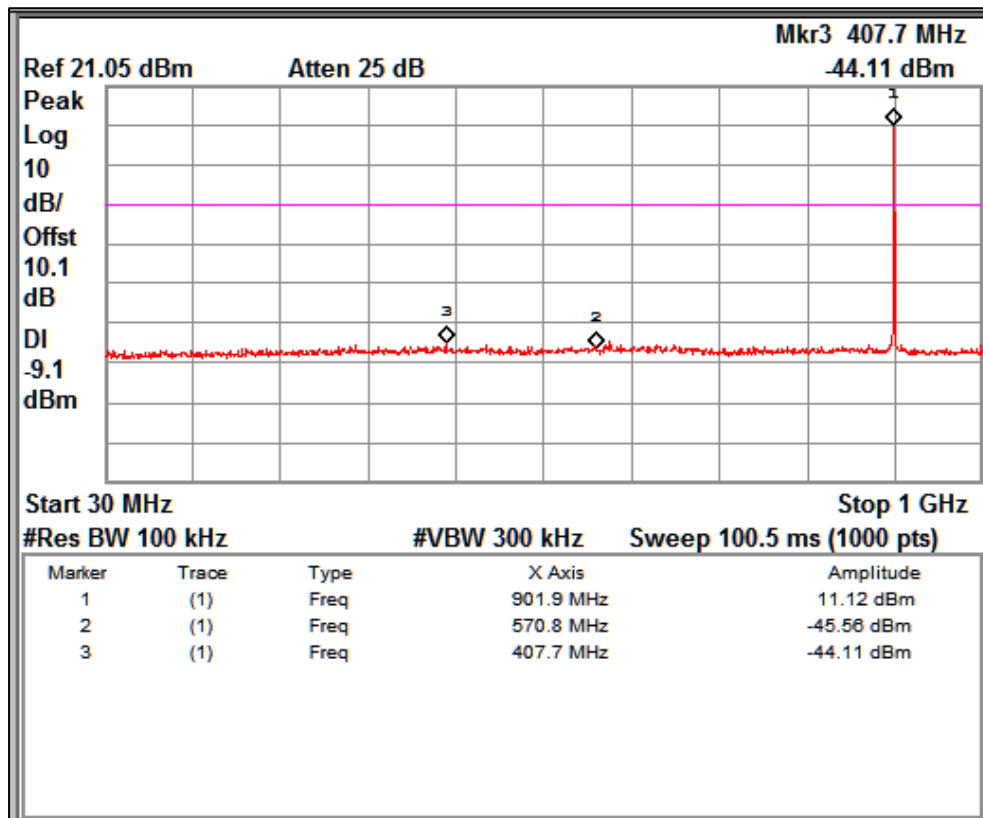
Channel Frequency 902.2MHz

Frequency Range 10MHz – 30MHz

Prüfbericht - Nr.:
Test Report No.:

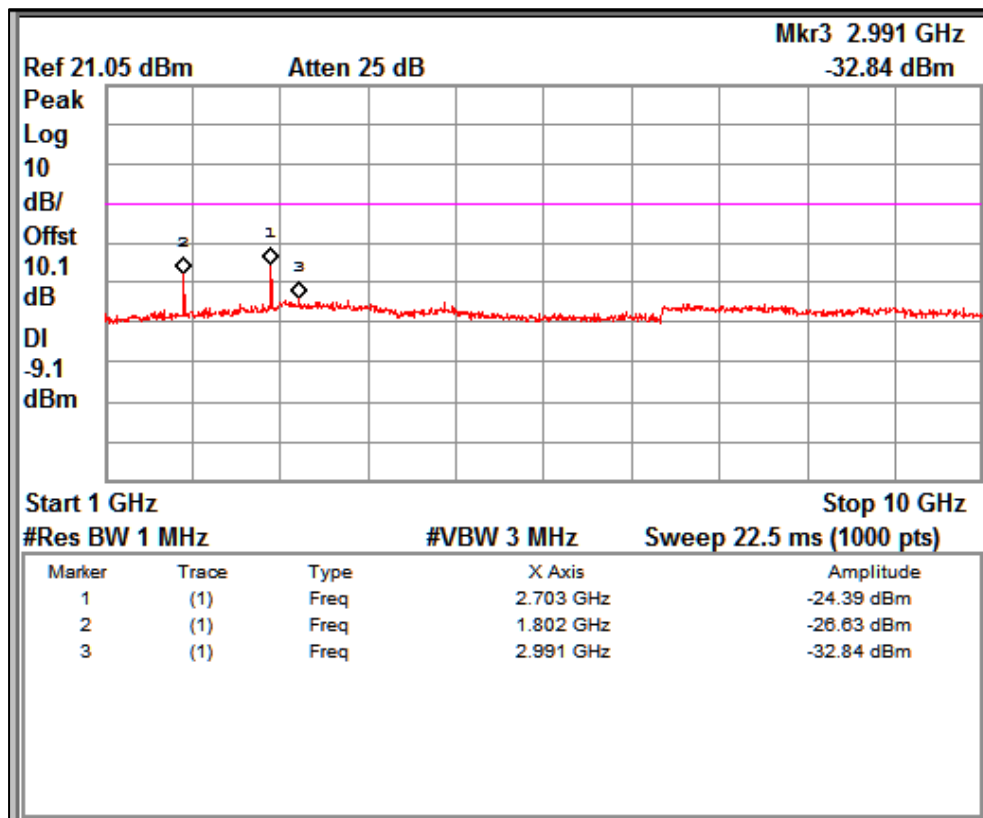
ULR-TC568820300000046F

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Channel Frequency 902.2MHz

Frequency Range 30MHz - 1GHz



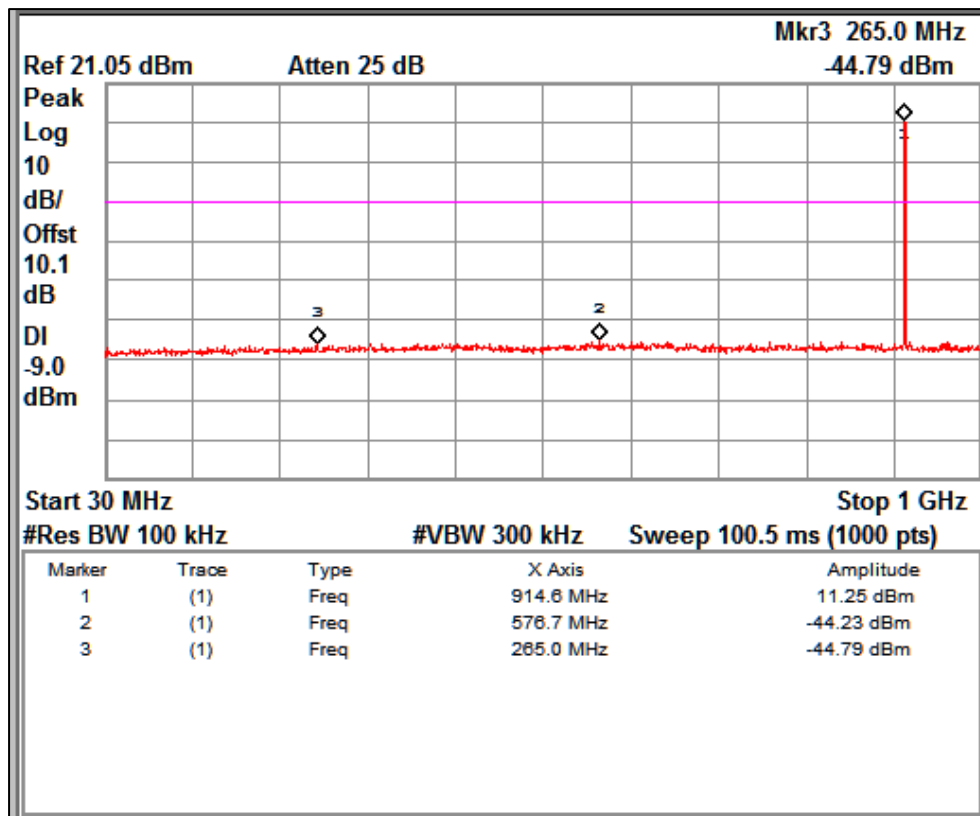
Channel Frequency 902.2MHz

Frequency Range 1GHz - 10GHz

Prüfbericht - Nr.:
Test Report No.:

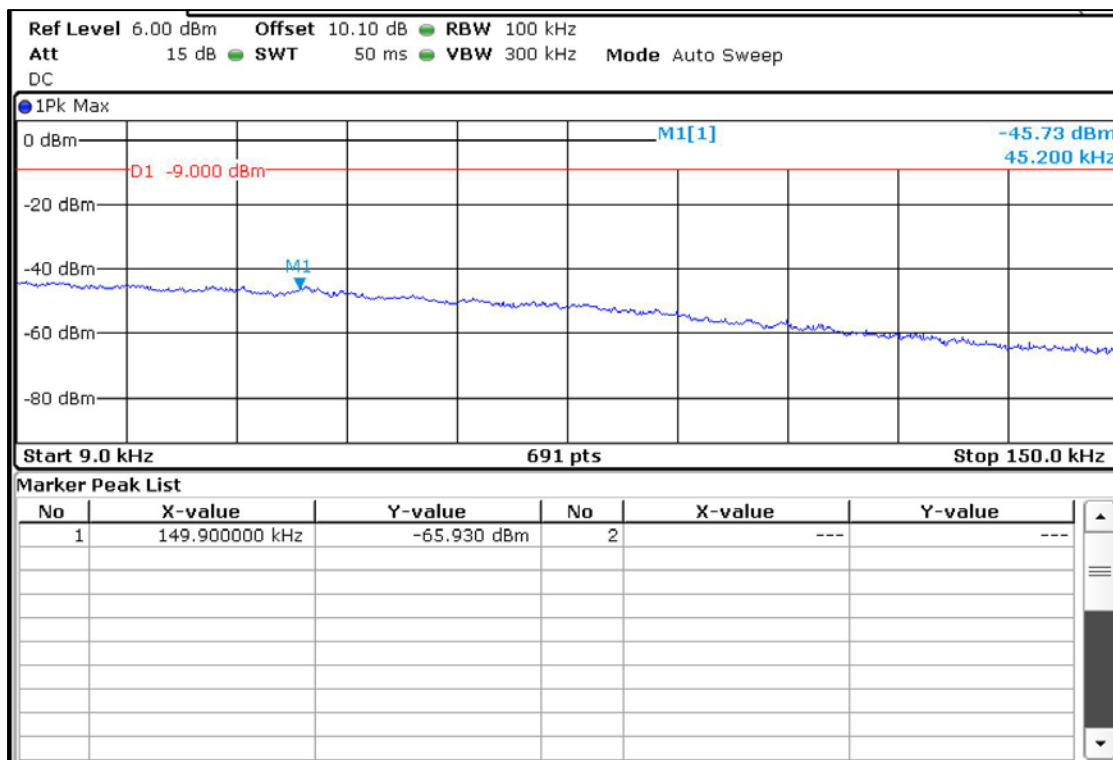
ULR-TC568820300000046F

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Channel Frequency 915MHz

Frequency Range 30MHz - 1GHz



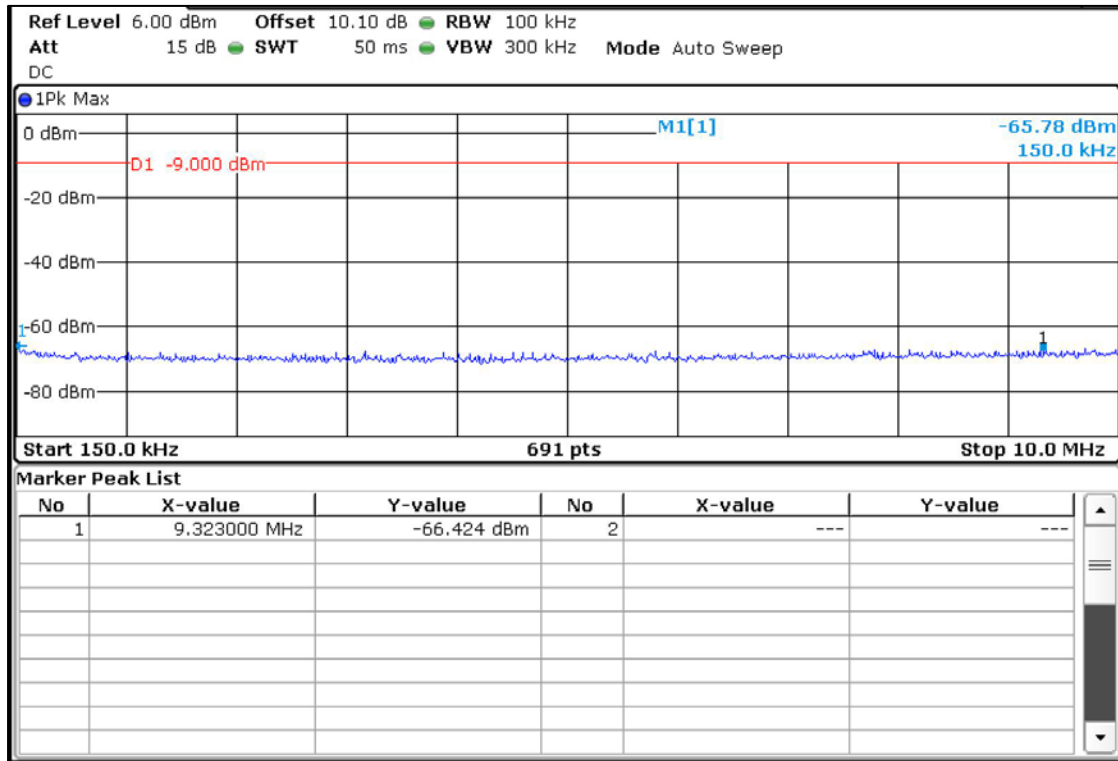
Channel Frequency 927MHz

Frequency Range 9KHz – 150kHz

Prüfbericht - Nr.:
Test Report No.:

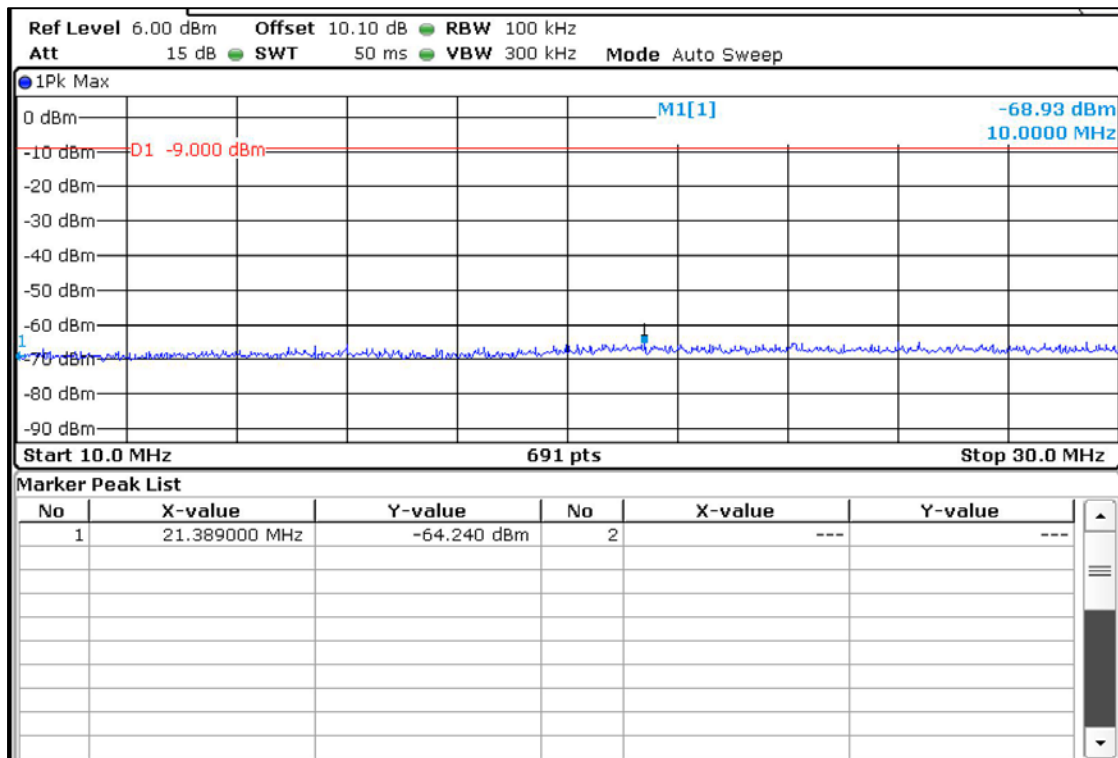
ULR-TC568820300000046F

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Channel Frequency 927MHz

Frequency Range 150kHz – 10MHz



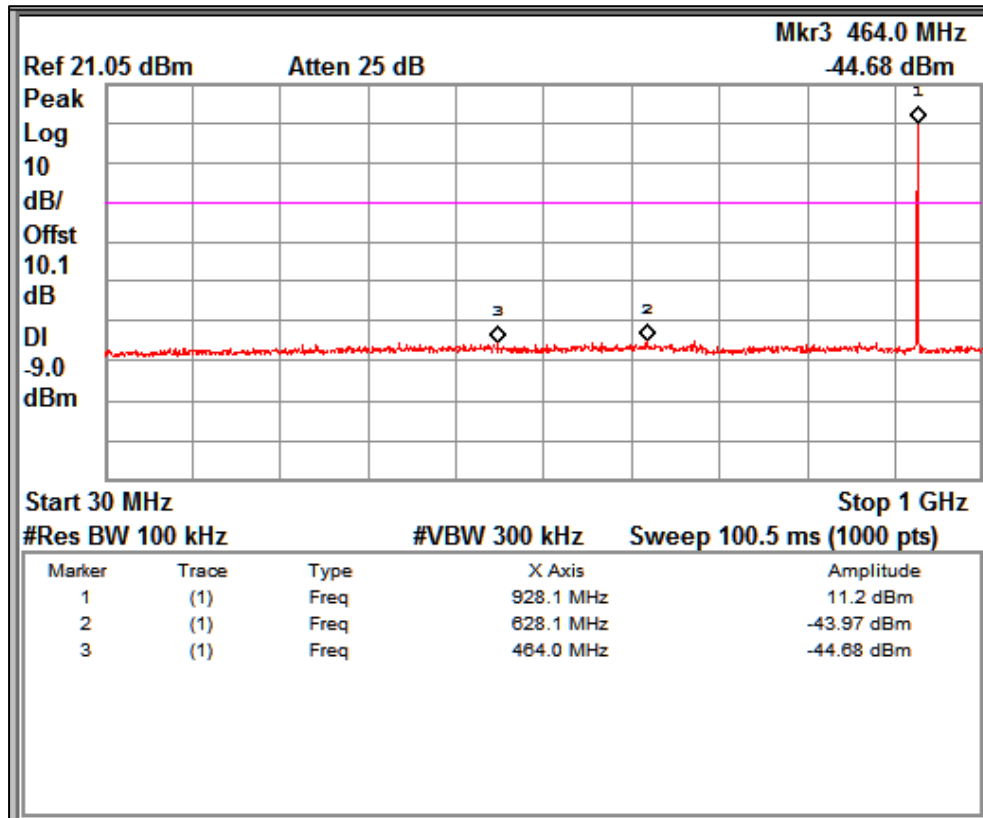
Channel Frequency 927MHz

Frequency Range 10MHz – 30MHz

Prüfbericht - Nr.:
Test Report No.:

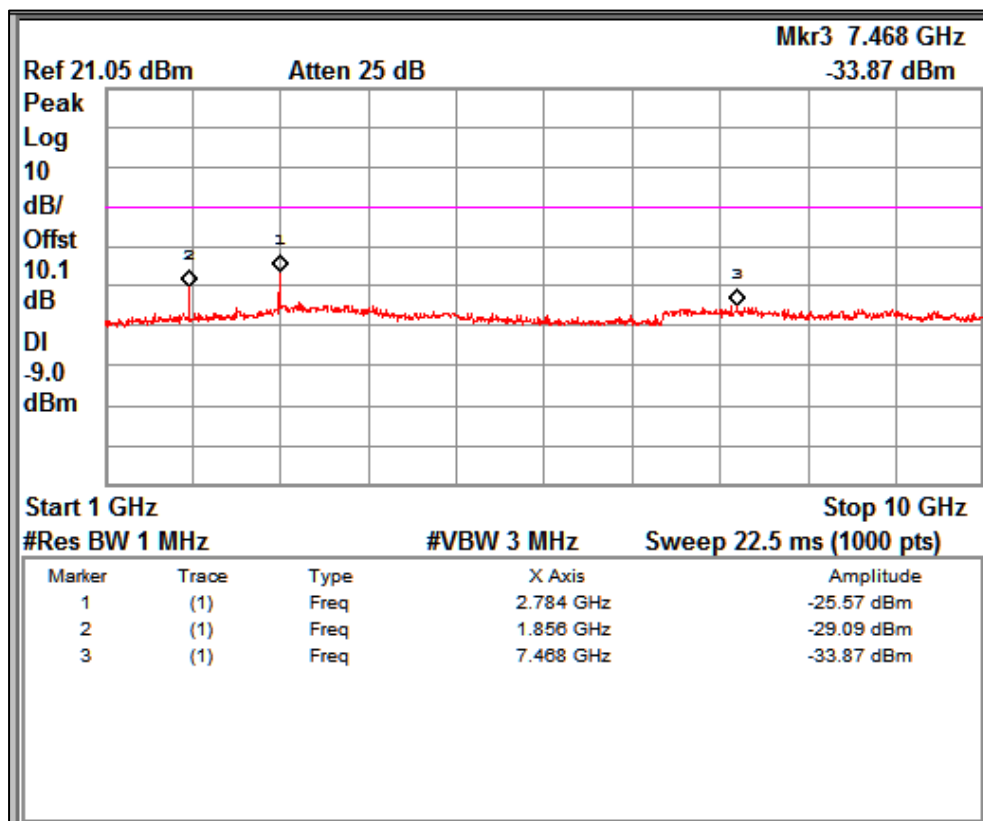
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Channel Frequency 927MHz

Frequency Range 30MHz - 1GHz



Channel Frequency 927MHz

Frequency Range 1GHz – 10GHz

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8.7 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 = 6V DC Supply

Relative humidity: 63%

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Test results:

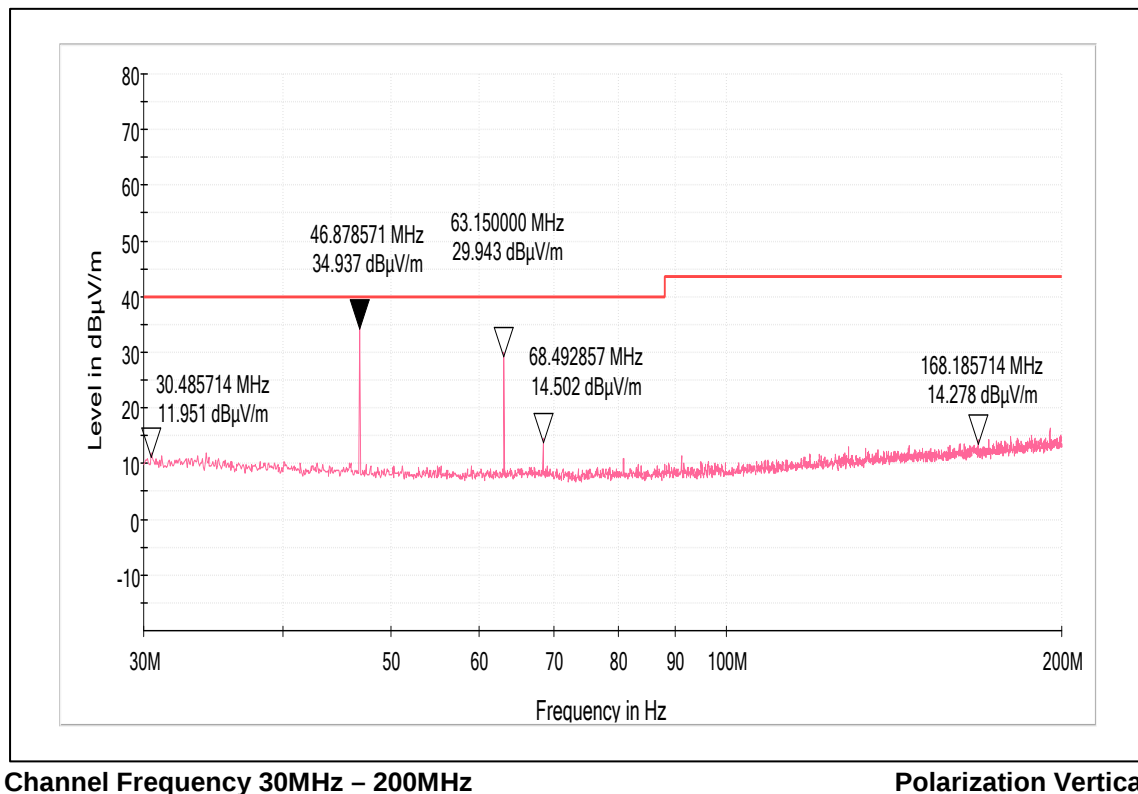
Note: All the losses are included during measurement and final values are mentioned in the test report. Refer TEST METHODOLOGY for more details

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

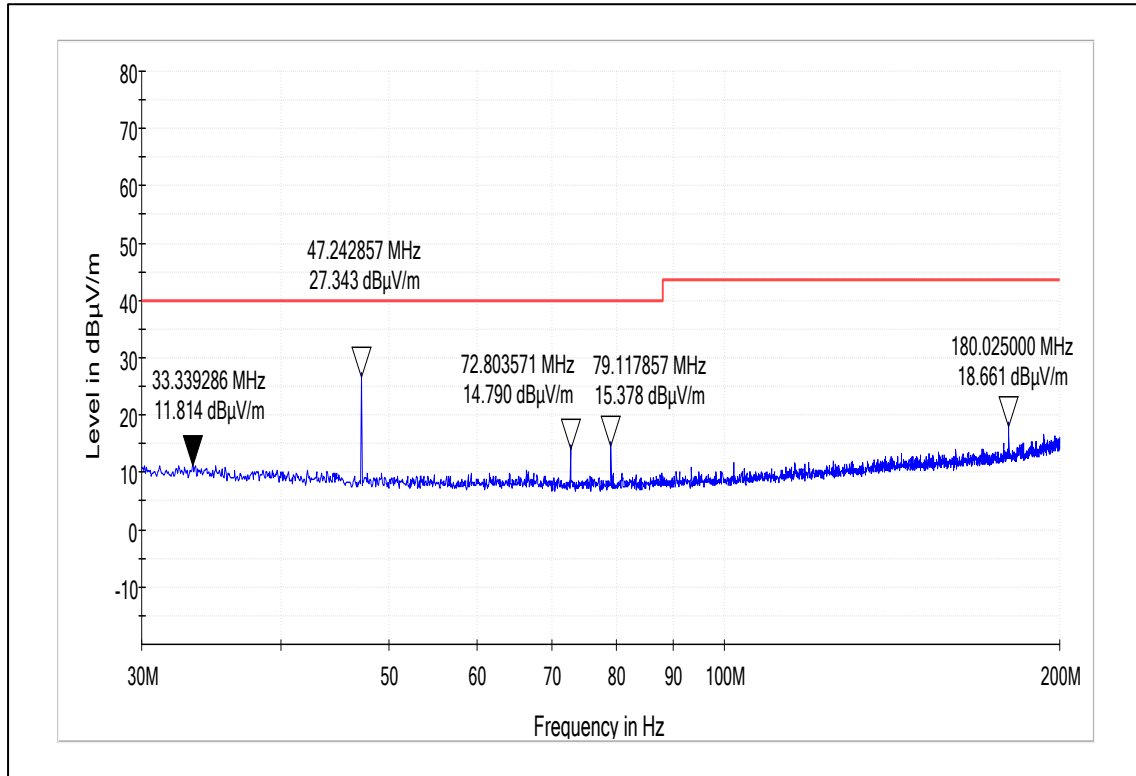
Antenna Polarization	Frequency (MHz)	Peak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
Vertical	30.485	11.95	40.00	-28.05
	46.878	34.93	40.00	-5.07
	63.150	29.94	40.00	-10.06
	68.492	14.50	40.00	-25.50
Horizontal	33.339	11.81	40.00	-28.19
	47.242	27.34	40.00	-12.66
	72.803	14.79	40.00	-25.21
	79.117	15.37	40.00	-24.63



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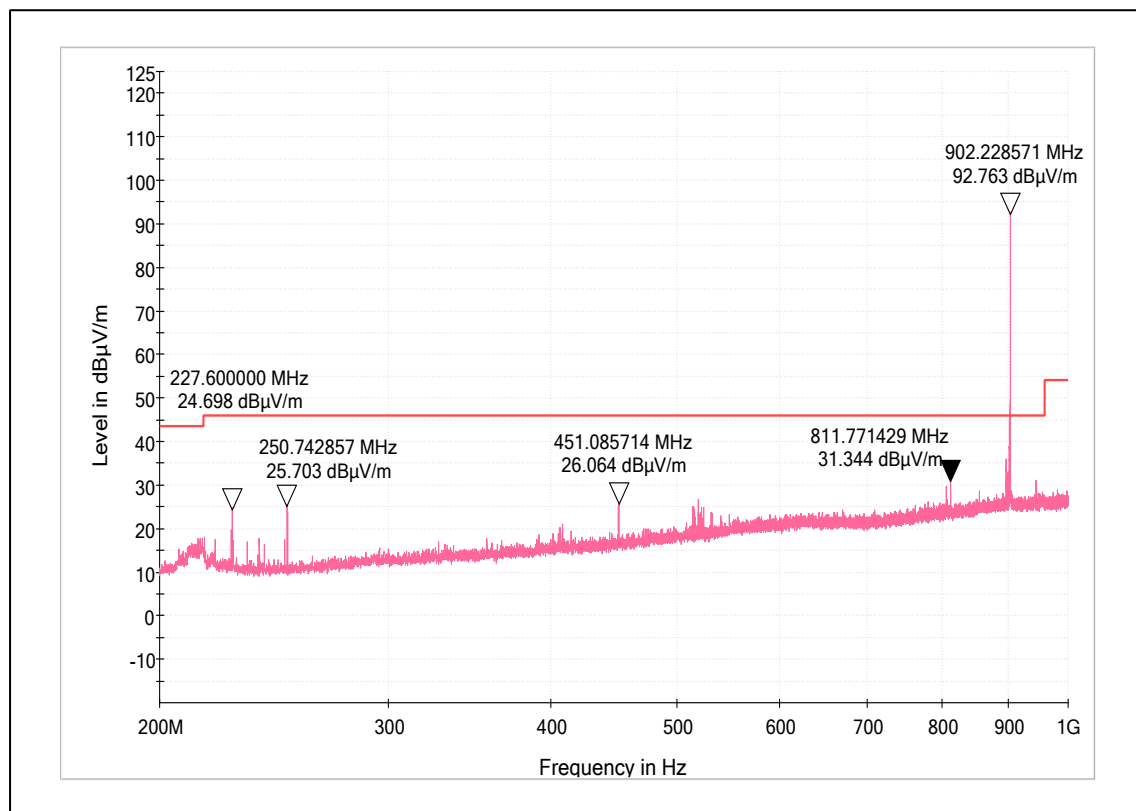


Channel Frequency 30MHz – 200MHz

Polarization Horizontal

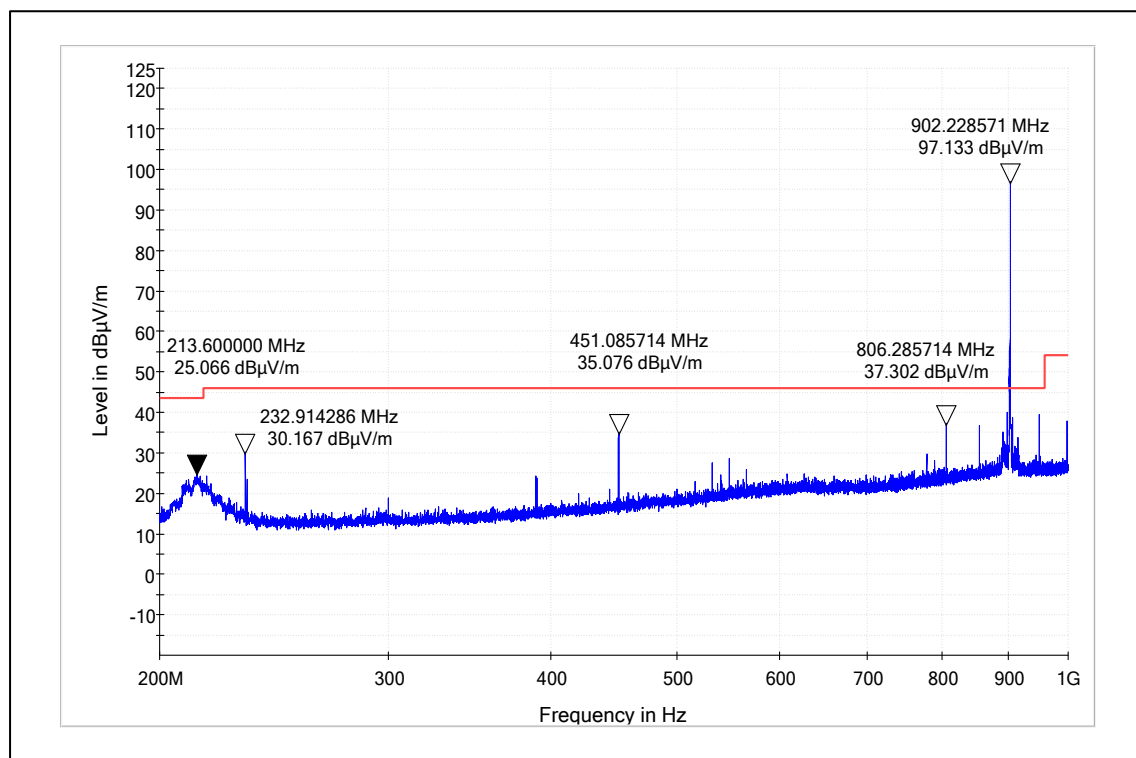
Test results for frequency range 200MHz – 1GHz

Antenna Polarization	Frequency (MHz)	Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Vertical	360.44	18.83	46.00	-27.17
	464.49	24.95	46.00	-21.05
	540.02	22.40	46.00	-23.6
	831.05	30.75	46.00	-15.25
Horizontal	300.02	23.80	46.00	-22.2
	463.52	30.13	46.00	-15.87
	831.05	35.19	46.00	-10.81
	878.99	34.76	46.00	-11.24



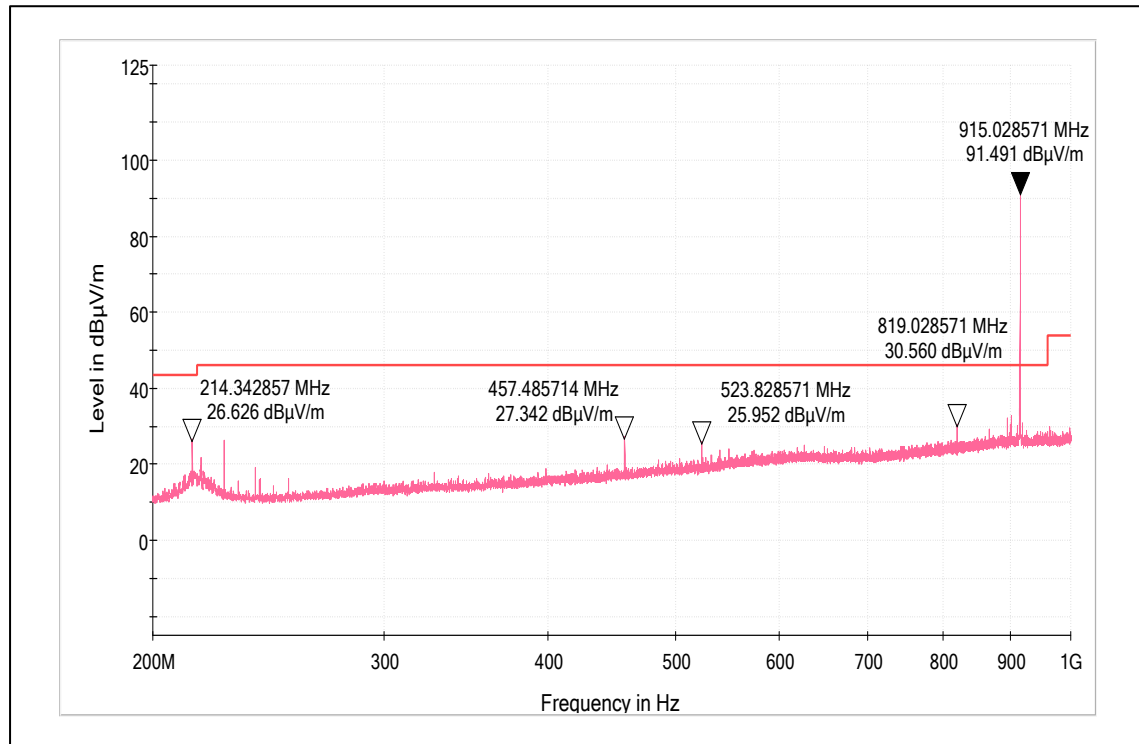
Channel Frequency 200MHz – 1GHz

Polarization Vertical



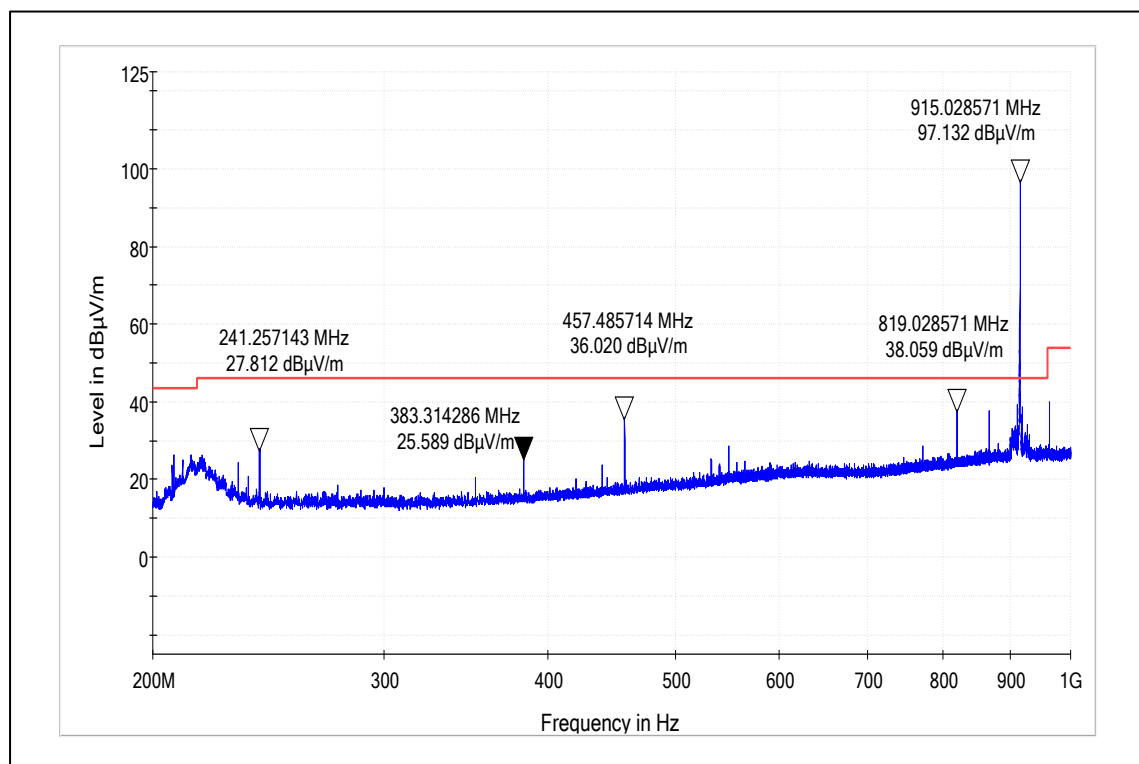
Channel Frequency 200MHz – 1GHz

Polarization Horizontal



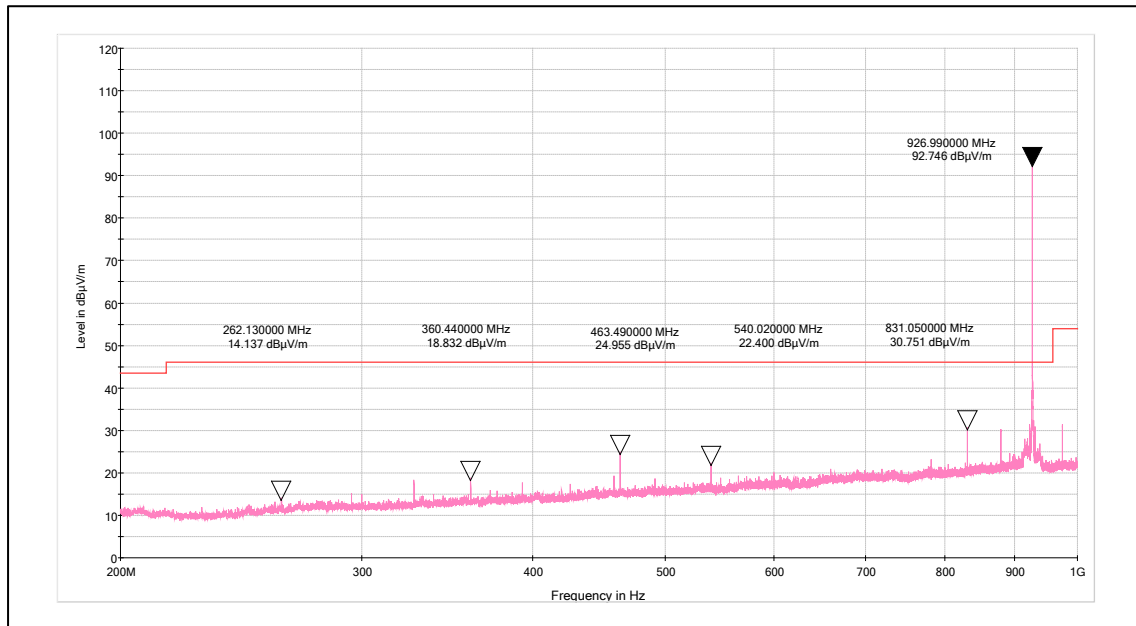
Channel Frequency 200MHz – 1GHz

Polarization Vertical



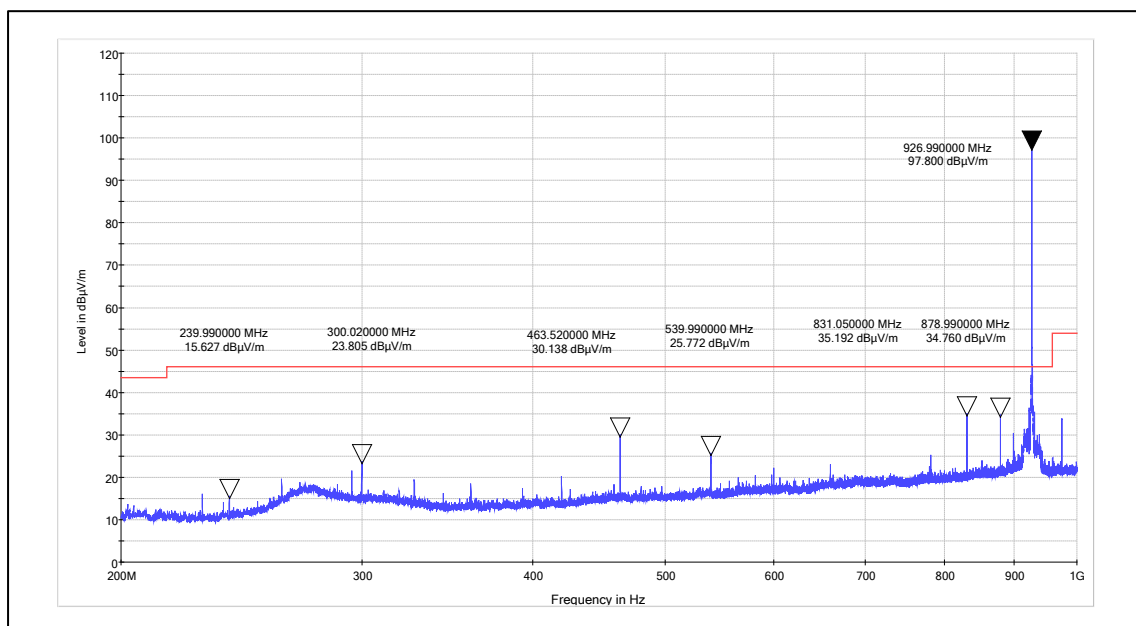
Channel Frequency 200MHz – 1GHz

Polarization Horizontal



Channel Frequency 200MHz – 1GHz

Polarization Vertical



Channel Frequency 200MHz – 1GHz

Polarization Horizontal

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Test results for the frequencies above 1GHz

Channel Frequency (MHz)	Antenna Polarization	Measured Frequency (MHz)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
902.2	V	902.2(Pk)	92.76	-	-
		1804.4(Pk)	42.39	74	-31.61
		1804.4(Av)	39.12	54	-14.88
		2706.6(Pk)	46.80	74	-27.20
		2706.6(Av)	44.11	54	-9.89
		3608.8(Pk)	38.47	74	-35.53
		3608.8(Av)	26.14	54	-27.86
		4511.0(Pk)	41.72	74	-32.28
		4511.0(Av)	29.49	54	-24.51
		5413.2(Pk)	No Harmonics Found		
		5413.2(Av)			
		6315.4(Pk)	45.17	74	-28.83
		6315.4(Av)	33.10	54	-20.90
		7217.6(Pk)	47.06	74	-26.94
		7217.6(Av)	34.96	54	-19.04
		8119.8(Pk)	47.79	74	-26.21
		8119.8(Av)	35.80	54	-18.20
		9022.0(Pk)	49.47	74	-24.53
		9022.0(Av)	36.86	54	-17.14
	H	902.2(Pk)	97.13	-	-
		1804.4(Pk)	48.67	74	-25.33
		1804.4(Av)	47.01	54	-6.99
		2706.6(Pk)	48.96	74	-25.04
		2706.6(Av)	50.62	54	-3.38
		3608.8(Pk)	38.11	74	-35.89
		3608.8(Av)	26.31	54	-27.69
		4511.0(Pk)	41.04	74	-32.96
		4511.0(Av)	28.73	54	-25.27
		5413.2(Pk)	No Harmonics Found		
		5413.2(Av)			
		6315.4(Pk)	43.30	74	-30.70
		6315.4(Av)	31.08	54	-22.92
		7217.6(Pk)	47.24	74	-26.76
		7217.6(Av)	34.97	54	-19.03
		8119.8(Pk)	48.32	74	-25.68
		8119.8(Av)	35.71	54	-18.29
		9022.0(Pk)	49.23	74	-24.77
		9022.0(Av)	36.86	54	-17.14

Pk: Peak Detector;
Av: Average Detector

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Channel Frequency (MHz)	Antenna Polarization	Measured Frequency (MHz)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
915	V	915.00(Pk)	91.49	-	-
		1830.0(Pk)	44.27	74	-29.73
		1830.0(Av)	41.27	54	-12.73
		2745.0(Pk)	53.01	74	-20.99
		2745.0(Av)	51.70	54	-2.30
		3660.0(Pk)	38.92	74	-35.08
		3660.0(Av)	26.14	54	-27.86
		4575.0(Pk)	40.09	74	-33.91
		4575.0(Av)	28.51	54	-25.49
		5490.0(Pk)	No Harmonics Found		
		5490.0(Av)			
		6405.0(Pk)	43.57	74	-30.43
		6405.0(Av)	31.06	54	-22.94
		7320.0(Pk)	47.29	74	-26.71
		7320.0(Av)	34.96	54	-19.04
		8235.0(Pk)	48.22	74	-25.78
		8235.0(Av)	35.71	54	-18.29
		9150.0(Pk)	49.17	74	-24.83
		9150.0(Av)	36.83	54	-17.17
	H	915.00(Pk)	97.13	-	-
		1830.0(Pk)	52.73	74	-21.27
		1830.0(Av)	51.88	54	-2.12
		2745.0(Pk)	57.39	74	-16.61
		2745.0(Av)	51.58	54	-2.42
		3660.0(Pk)	37.90	74	-36.1
		3660.0(Av)	26.10	54	-27.9
		4575.0(Pk)	40.28	74	-33.72
		4575.0(Av)	28.45	54	-25.55
		5490.0(Pk)	No Harmonics Found		
		5490.0(Av)			
		6405.0(Pk)	43.65	74	-30.35
		6405.0(Av)	31.08	54	-22.92
		7320.0(Pk)	46.95	74	-27.05
		7320.0(Av)	34.96	54	-19.04
		8235.0(Pk)	47.63	74	-26.37
		8235.0(Av)	35.77	54	-18.23
		9150.0(Pk)	49.17	74	-24.83
		9150.0(Av)	36.83	54	-17.17

Pk: Peak Detector;
Av: Average Detector

Prüfbericht - Nr.:
Test Report No.:

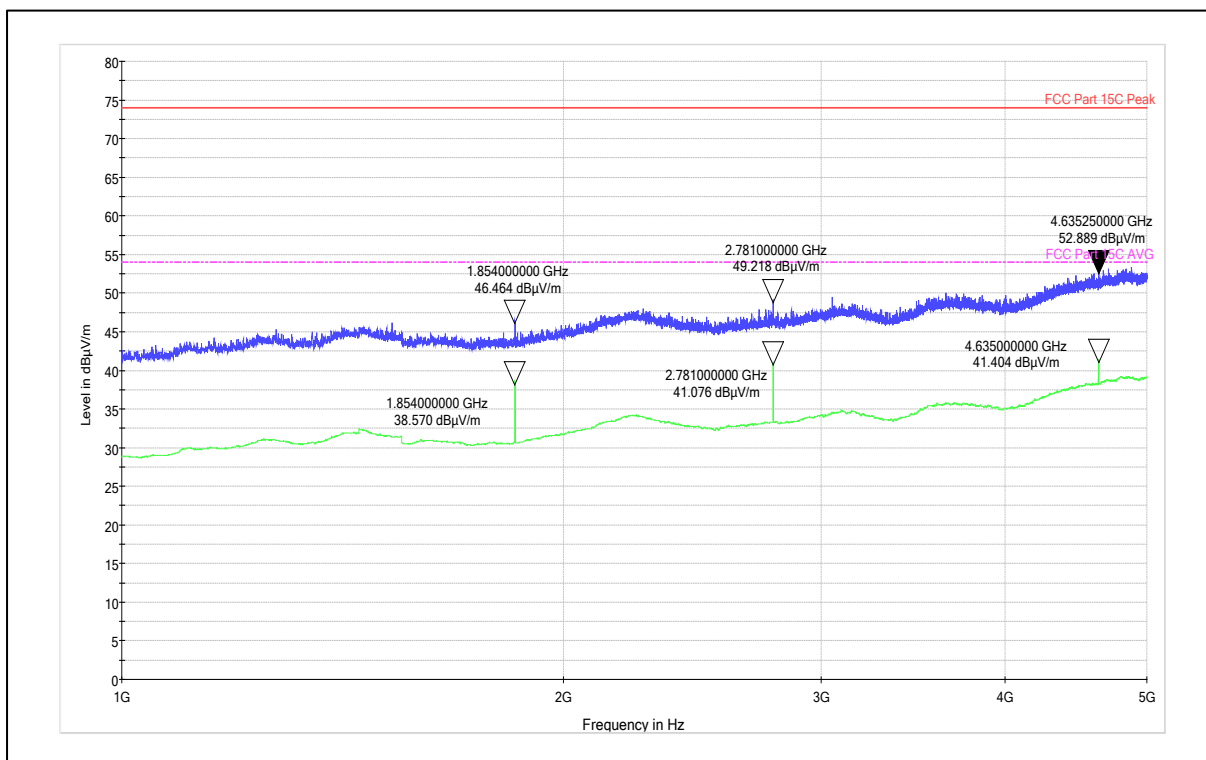
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Channel Frequency (MHz)	Antenna Polarization	Measured Frequency (MHz)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
927	V	927.00(Pk)	92.74	-	-
		1854.00(Pk)	46.17	74	-27.83
		1854.00(Av)	38.82	54	-15.18
		2781.00(Pk)	48.75	74	-25.25
		2781.00(Av)	41.48	54	-12.52
		3708.00(Pk)	48.57	74	-25.43
		3708.00(Av)	35.72	54	-18.28
		4635.00(Pk)	52.65	74	-21.35
		4635.00(Av)	41.63	54	-12.37
		5562.00(Pk)	43.00	74	-31.00
		5562.00(Av)	32.58	54	-21.42
		6489.00(Pk)	47.60	74	-26.40
		6489.00(Av)	33.90	54	-20.10
		7416.00(Pk)	48.10	74	-25.90
		7416.00(Av)	36.15	54	-17.85
		8343.00(Pk)	50.38	74	-23.62
		8343.00(Av)	37.22	54	-16.78
		9270.00(Pk)	52.73	74	-21.27
		9270.00(Av)	40.67	54	-13.33
	H	927.00(Pk)	97.80	-	-
		1854.00(Pk)	48.88	74	-25.12
		1854.00(Av)	44.86	54	-9.14
		2781.00(Pk)	55.53	74	-18.47
		2781.00(Av)	53.39	54	-0.61
		3708.00(Pk)	49.74	74	-24.26
		3708.00(Av)	35.77	54	-18.23
		4635.00(Pk)	51.92	74	-22.08
		4635.00(Av)	39.65	54	-14.35
		5562.00(Pk)	43.19	74	-30.81
		5562.00(Av)	30.76	54	-23.24
		6489.00(Pk)	45.33	74	-28.67
		6489.00(Av)	32.99	54	-21.01
		7416.00(Pk)	48.70	74	-25.30
		7416.00(Av)	36.12	54	-17.88
		8343.00(Pk)	49.65	74	-24.35
		8343.00(Av)	37.29	54	-16.71
		9270.00(Pk)	52.76	74	-21.24
		9270.00(Av)	40.67	54	-13.33

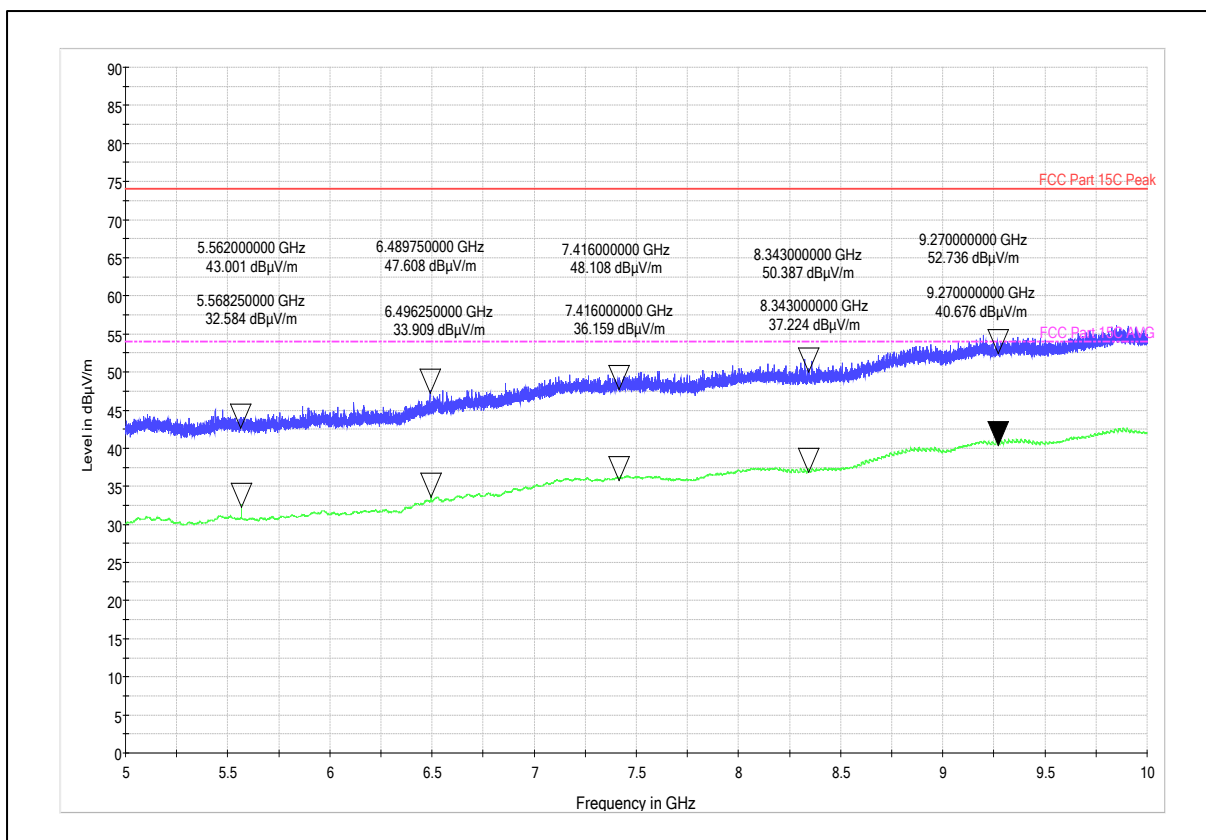
Pk: Peak Detector;
Av: Average Detector

Worst case Plots
Channel Frequency 927MHz



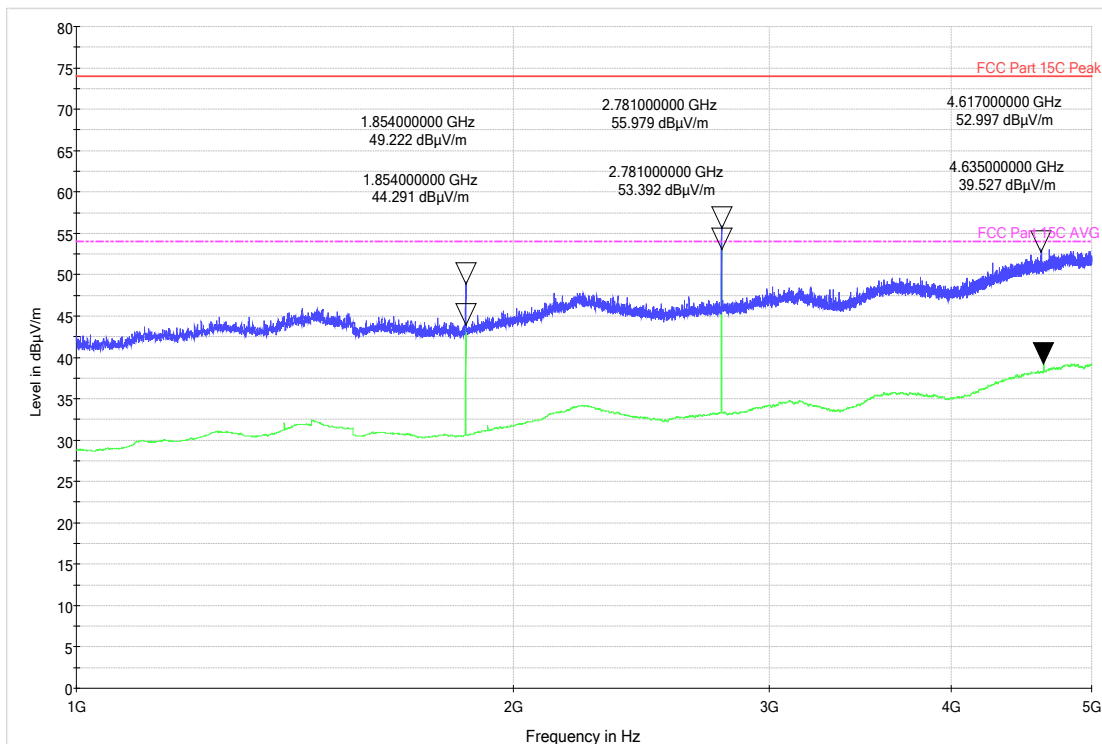
Channel Frequency: 1GHz – 5GHz

Polarization: Vertical



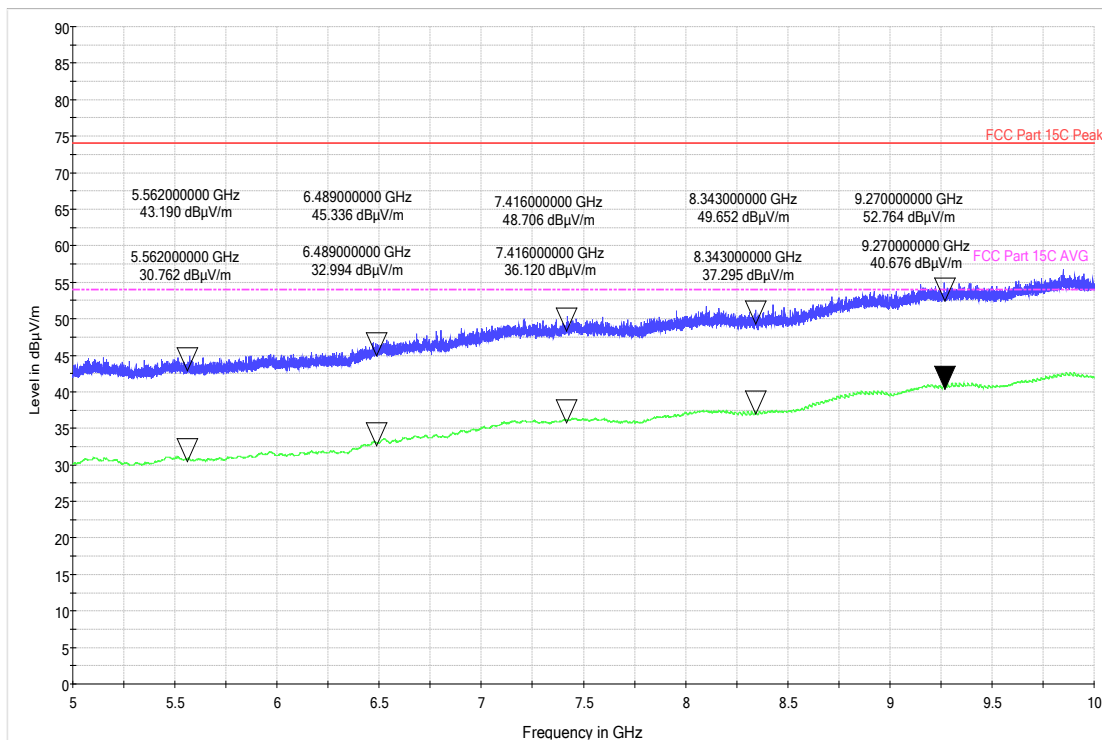
Channel Frequency: 5GHz – 10GHz

Polarization: Vertical



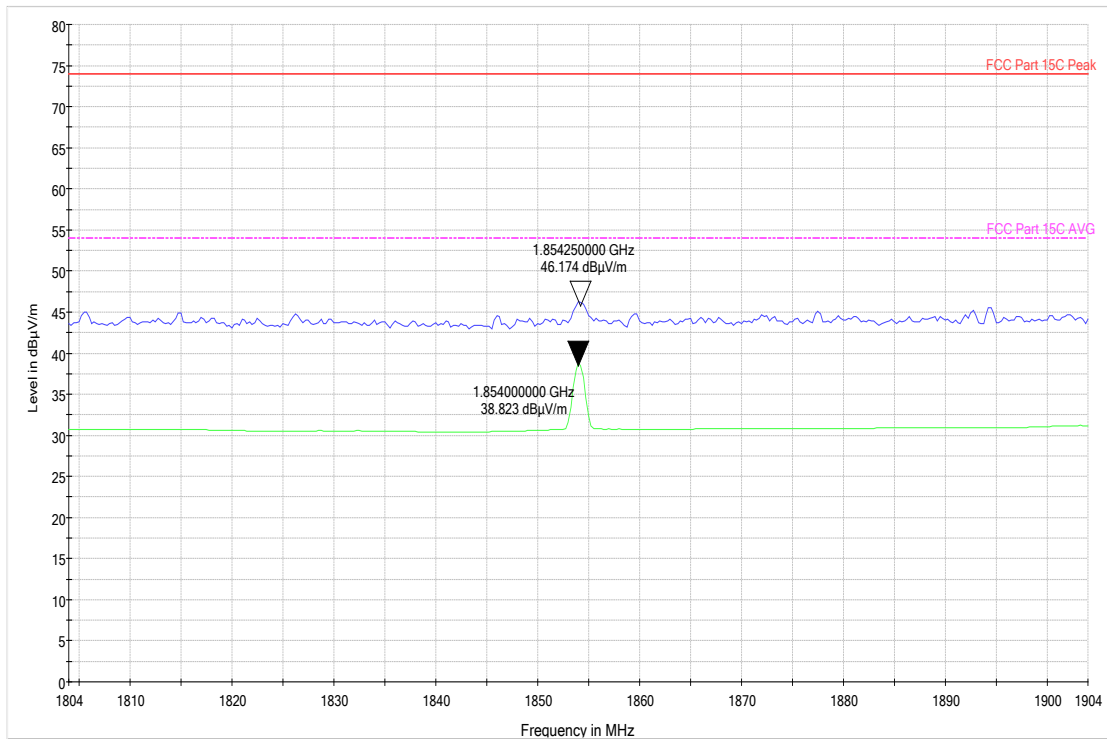
Channel Frequency: 1GHz -5GHz

Polarization: Horizontal



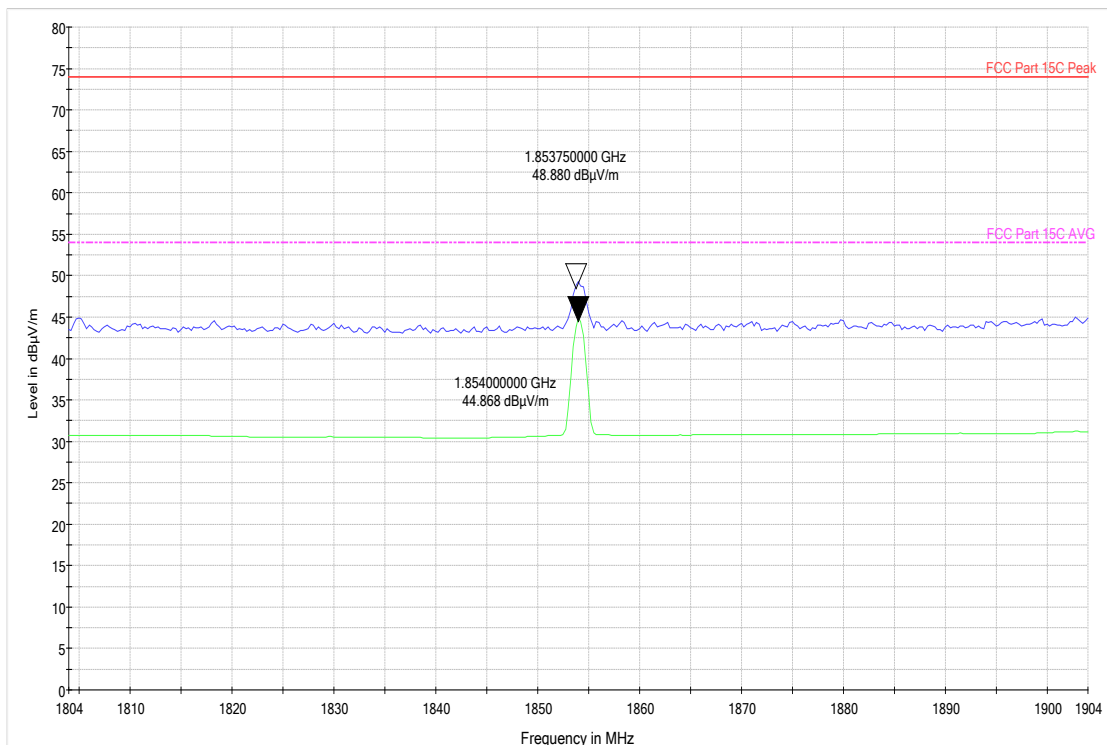
Channel Frequency: 1GHz -5GHz

Polarization: Horizontal



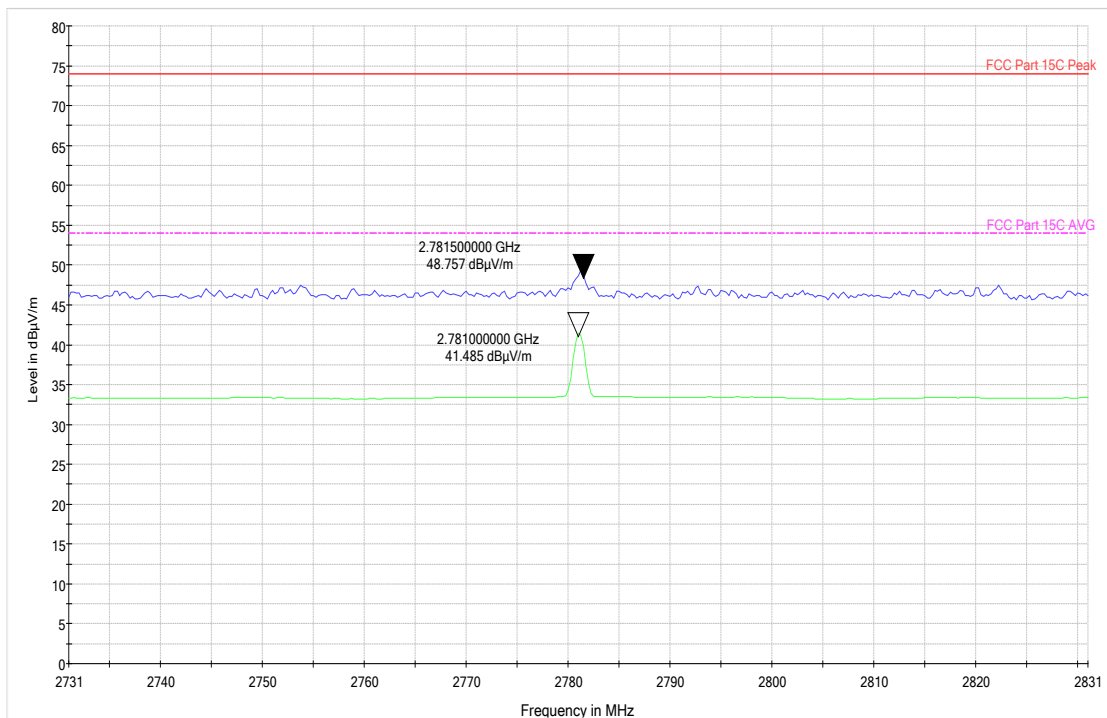
Channel Frequency: 2nd Harmonics

Polarization: Vertical



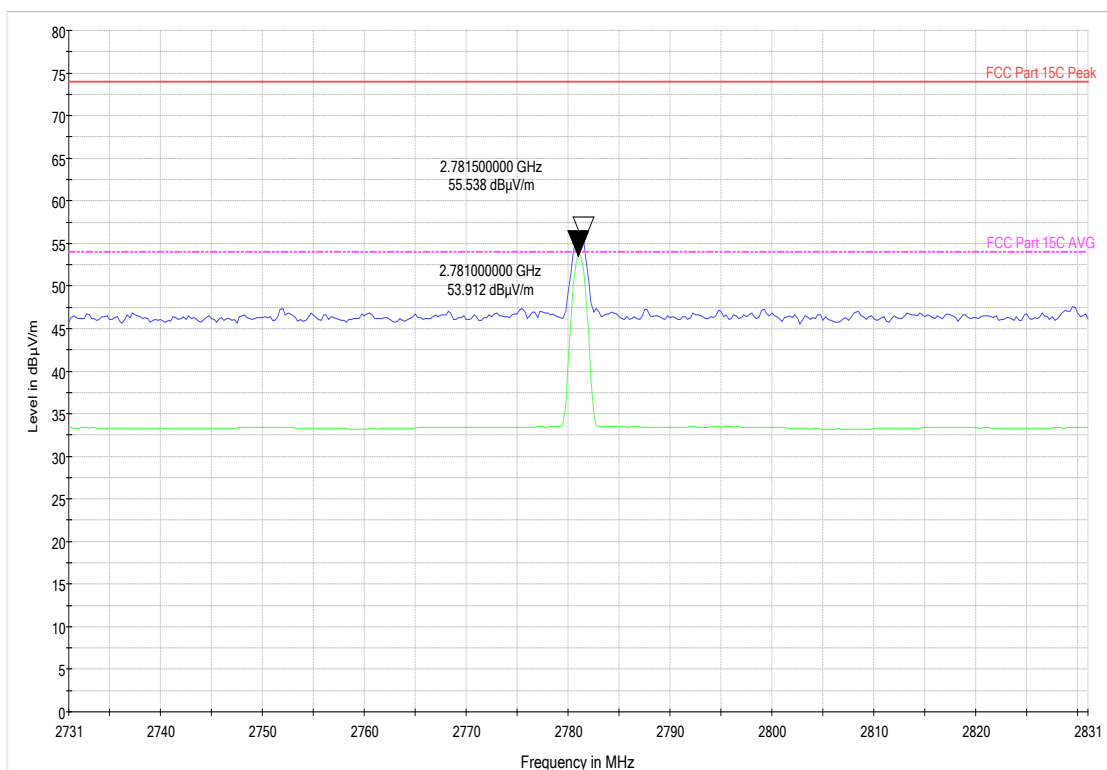
Channel Frequency: 2nd Harmonics

Polarization: Horizontal



Channel Frequency: 3rd Harmonics

Polarization: Vertical



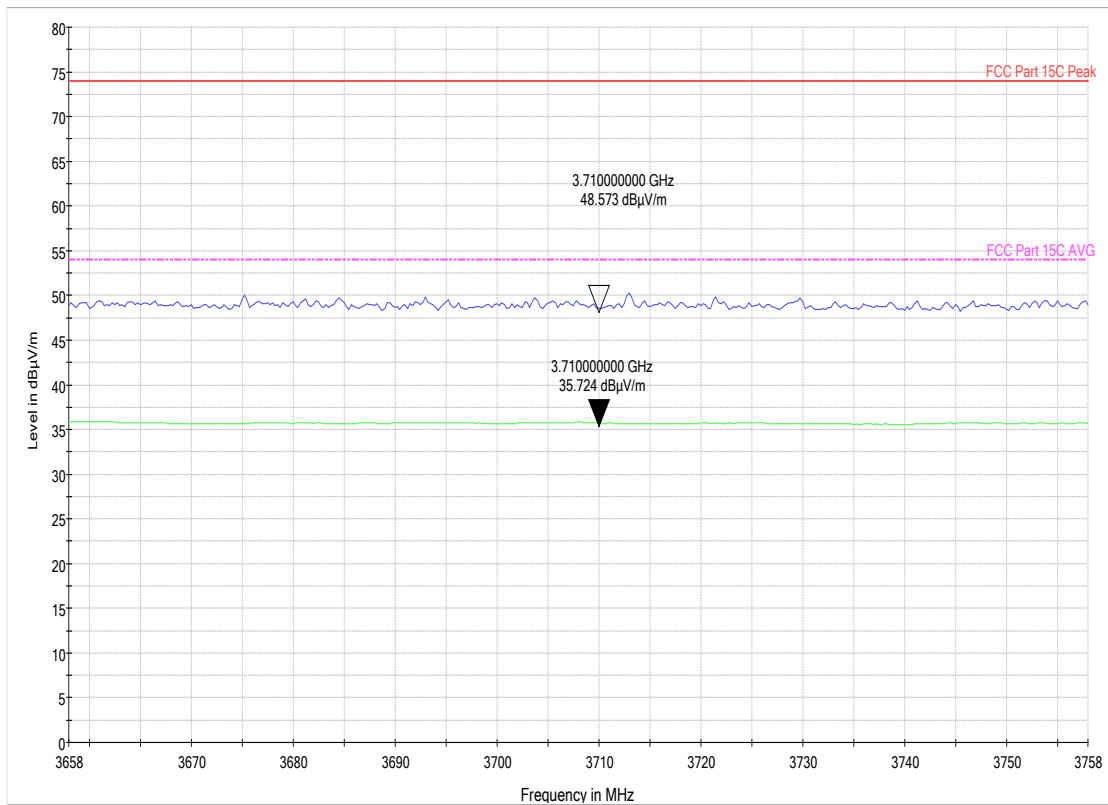
Channel Frequency: 3rd Harmonics

Polarization: Horizontal

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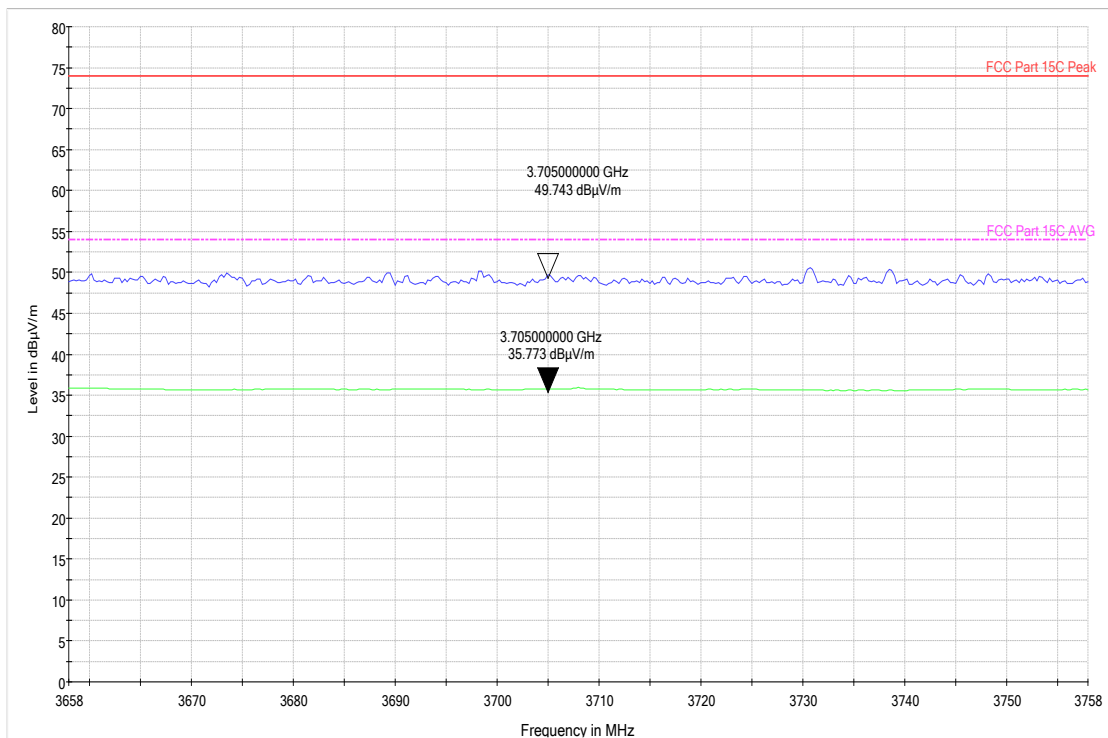
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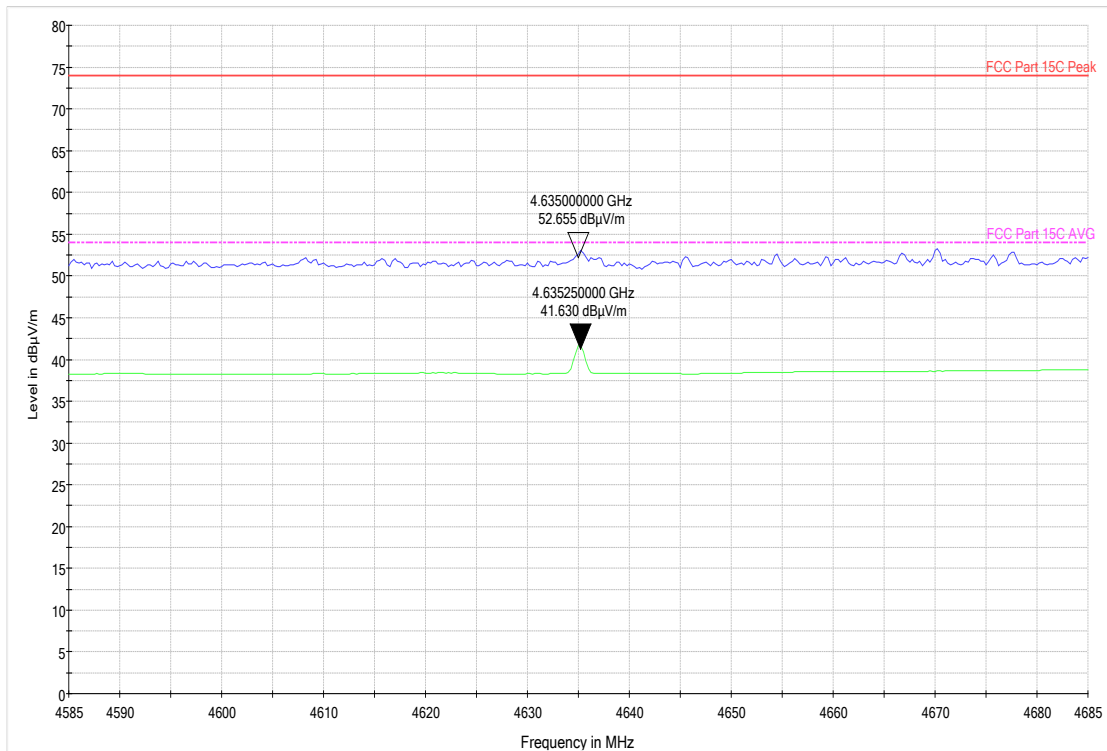
Channel Frequency: 4th Harmonics

Polarization: Vertical



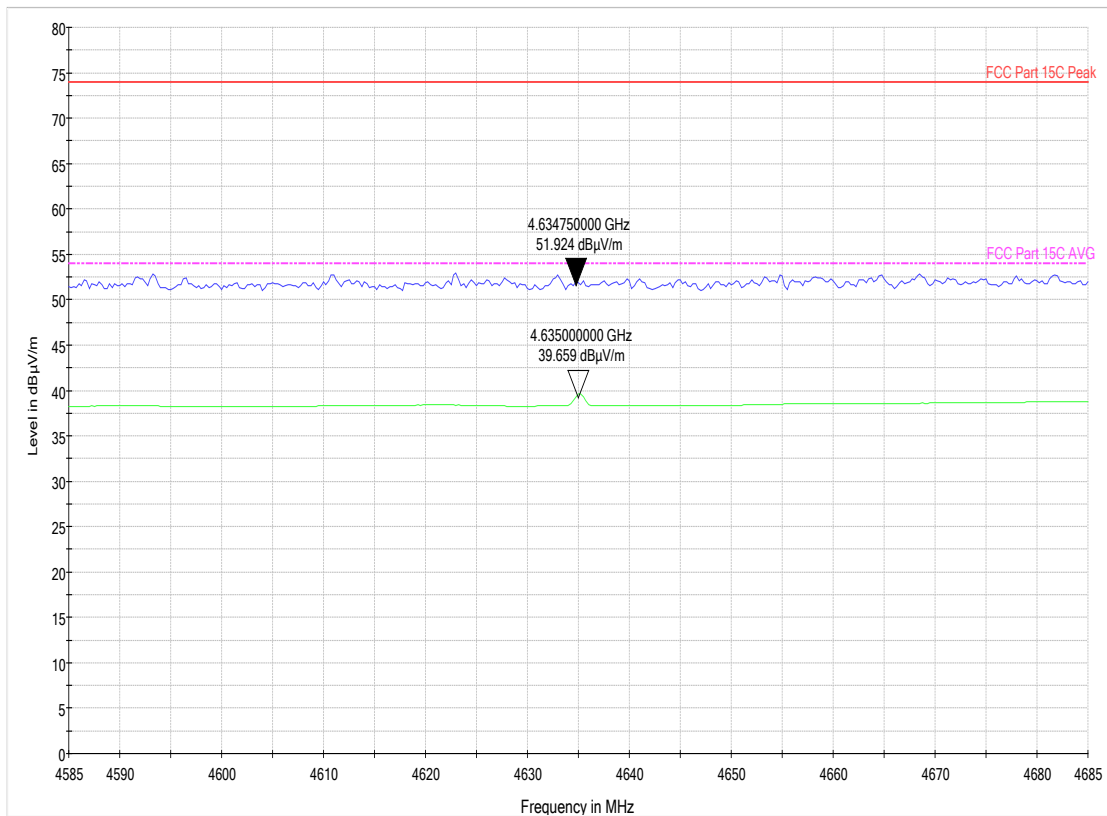
Channel Frequency: 4th Harmonics

Polarization: Horizontal



Channel Frequency: 5th Harmonics

Polarization: Vertical



Channel Frequency: 5th Harmonics

Polarization: Horizontal

9 Radio Frequency Human Exposure Evaluation:

9.1 SAR Test Exclusion

Based on the conducted power measurement, reported under section " Maximum conducted power " of respective test report and derivation of Low-Power exclusion level defined in FCC KDB 447498 D01 General RF Exposure Guidance v06 (See 4.3 a), SAR test exclusion was identified for the followong frequency band

Protocol	Frequency band (MHz)	Maximum measured RF output power at antenna terminal (dBm)	Tune-up tolerance	Max power Including tune-up tolerance * (mW)	Exclusion threshold ** for separation distance of 50mm (W)	SAR Test required (Yes/No)
Sub GHz	915	11.08	±1	16.1436	0.3088	No

*Max power is rounded to two decimal place for reporting

**separation distance of 50mm is used for the calculation

Note: Manufacturer declared TuneUp tollarance of ±1dB is considered in the calculation

Hence RF exposure evaluation or SAR testing is not required for Sub-GHz frequency range

- Per KDB 447498 D01v06, the 1-g and 10-g SAR Test Exclusion threshold for 100MHz to 6GHz at separation distance ≤50mm are determined by

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$$
 for 1-g SAR, and ≤ 7.5 for 10-g extremity SAR

Where

f (GHz) is the RF channel transmit frequency in GHz

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