

Prüfbericht-Nr.: <i>Test report no.:</i>	ULR-TC568822300000027F	Auftrags-Nr.: <i>Order no.:</i>	146666947 010	Seite 1 von 50 Page 1 of 50
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	2130976	Auftragsdatum: <i>Order date:</i>	06.04.2022	
Auftraggeber: <i>Client:</i>	ClodPi Labs India Private Limited No.25 & 26, Vivekananda Nagar,1st Cross, Electronic City, Bengaluru, KA, IND-560100			
Prüfgegenstand: <i>Test item:</i>	LoRaWAN® Concentrator miniPCle - USB / SPI			
Bezeichnung <i>Identification</i>	CPLWCC-915	Serien -Nr.: <i>Serial no.:</i>	Engineering Sample	
Auftrags-Inhalt: <i>Order content:</i>	Testing and issue of Test Report and Grant Certificate			
Prüfgrundlage: <i>Test specification:</i>	FCC Part 15 Subpart C 15.247,15.205, 15.207 & 15.209 RSS 247 Issue 2, RSS Gen Issue 5			
Wareneingangsdatum: <i>Date of sample receipt:</i>	04.04.2022			
Prüfmuster-Nr.: <i>Test sample no.:</i>	A003238254-001			
Prüfzeitraum: <i>Testing period:</i>	06.04.2022 - 08.04.2022			
Ort der Prüfung: <i>Place of testing:</i>	Wireless laboratory, Bangalore			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (India) Pvt. Ltd. 27/B,2nd cross road, Electronic city Phase1, Bangalore-560100, India FCC Test Site Registration No: 496599 IC Test Site Registration No: 3466E-1			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von: <i>tested by:</i>	genehmigt von: <i>authorized by:</i>			
Datum: <i>Date:</i> 06.04.2022	Ausstellatum: <i>Issue date:</i> 16.05.2022			
Stellung / Position:	M.V.Naveen Kumar Engineer	Stellung / Position:	Lokesh Ramu Manager	
Sonstiges / Other:	FCC ID: 2A334-CPLWCC-915V3 IC: 28110-CPLWCC915Z3			
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>	Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>			
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	4 = ausreichend N/A = nicht anwendbar
* Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory F(ail) = failed a.m. test specification(s)	4 = sufficient N/A = not applicable
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>				

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TEST SUMMARY

Test Item	FCC	RSS	Result
Maximum conducted (Peak) output power	15.247 (b)(2)	RSS-247 issue 2 5.4 (a)	Pass
Occupied bandwidth and 20dB Bandwidth	15.247 (a) (i)	RSS-247 issue 2 5.1 (c)	Pass
Number of Hopping channels	15.247 (a) (i)	RSS-247 issue 2 5.1 (c)	Pass
Carrier Frequency Separation	15.247 (a) (1)	RSS-247 issue 2 5.1 (b)	Pass
Time of Occupancy (Dwell Time)	15.247 (a) (i)	RSS-247 issue 2 5.1 (c)	Pass
Emissions in non-restricted frequency bands	15.247 (d)	RSS-247 issue 2 5.5	Pass
Spurious Radiated Emissions and Restricted Bands of Operation	FCC 15.209 / FCC 15.205	RSS-GEN issue 5 Clause 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

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REVISION HISTORY OF THIS REPORT

Report Number	Version	Description	Issue date
ULR-TC568822300000027F	01	Initial issue of report	16.05.2022

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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) 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
Active loop antenna	Schwarzbeck	FMZB 1519 B	1519B-00111	-	27.04.2022	Yearly	Radiated Spurious Emission
Balun & Biconical Antenna	Schwarzbeck Mess-Elektronik	BBA 9106+V HBB 9124	9124-1117	-	03.02.2023	Yearly	
Log - Periodical Antenna	Schwarzbeck Mess-Elektronik	VUSLP 9111B	9111B-324	-	04.02.2023	Yearly	
Horn Antenna	Schwarzbeck	BBHA 9120 D	9120D-1944	-	11.05.2022	Yearly	
Semi Anechoic Chamber	Frankonia	-	-	-	-	-	
Fully Anechoic Chamber	Albatross	-	-	-	-	-	
EMI Receiver	Rohde & Schwarz	ESW 44	101732	4.73.SP5	19.05.2022	Yearly	
EMI Receiver	Rohde & Schwarz	ESW44	101773	1.72SP1	12.02.2023	Yearly	
Signal Analyser	Rohde & Schwarz	FSV7	101644	FW 3.40	25.01.2023	Yearly	
Spectrum Analyzer	Agilent	E4407B	US41192 772	A.14.06	15.12.2022	Yearly	

Table 2: Instrument application Software versions

SL. No.	Test Type	Application software	Version
1	Radiated spurious emission measurement in FAC	EMC 32	10.60.00
2	Radiated spurious emission measurement in 10mtr SAC	BAT EMC	3.20.0.17

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3 GENERAL PRODUCT INFORMATION

3.1 Product Function and Intended Use

The ClodPi's LoRaWAN® Concentrator miniPCle - USB / SPI - SX1302/3 CPLWCC-915 card based on Semtech SX1302/3 Core Cell Design in Mini PCIe Form Factor enables OEMs and system integrators to build high-performance, certified LoRaWAN gateway solutions.

3.2 Ratings and System Details of Equipment under Test

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

Protocol	LoRa
Operating Frequency Range	902.3MHz to 914.9MHz
	903.0MHz to 927.5MHz
No. of Channels	64+8+8
Channel Spacing	200kHz(DSS)
	1.6MHz(DTS)
Tx Transmitting Power	25dBm
Maximum Measured Power	25.27 dBm @ 908.5MHzMaximum Peak Conducted Output Power
Modulation	CSS
Data Rate	DR0
Number of antennas	1
Antenna Gain & Antenna Type	3.5dBi & Omni directional Antenna
Antenna Model	CW-868-915MHz195B-SMAMM
Supply Voltage to Product	3.3VDC through USB Port
Environmental conditions	-40 to +85°C Operating Conditions 10% ~ 90% RH Non-condensing
EUT Dimension(WxHxD)	51 x 30 x 4 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.

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: V3

Hardware Version Identification Number HVIN: CPLWCC915Z3

Software Version: V2.1.0

Firmware Version identification Number FVIN: NA

4.3 Special Accessories and Auxiliary Equipment

Raspberry Pi: Raspberry Pi 3 Model B+

4.4 Countermeasures to achieve EMC Compliance

None

4.5 List of frequencies

Frequency Band (GHz)	Channel No.	Frequency (MHz)
Sub-GHz (902 MHz – 915 MHz)	Low	902.3
	:	:
	Mid	908.5
	:	:
	High	914.9

Table 5: List of SubGHz Center frequencies

Channel used for SubGHz testing

Channel Low : 902.3MHz

Channel Mid : 908.5MHz

Channel High : 914.9MHz

Note:

1. TUV Sample Identification number : A003184912-001 – Radiated & Conducted test Sample

4.6 Report Reference

Radio Protocol	Report Number
RF Test Report for LoRa DSS(902.3MHz to 914.9MHz)	This Report
RF Test Report for LoRa DTS(903MHz to 927.5MHz)	ULR-TC568822300000027F

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5 Operational Description

The ClodPi's LoRaWAN® Concentrator miniPCle - USB / SPI - SX1302/3 CPLWCC-915 card is a radio modules that serve as communication devices within a LoRa network between end-devices and a LoRaWAN network server, This can receive data on 8 and 6 spreading factors simultaneously.

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

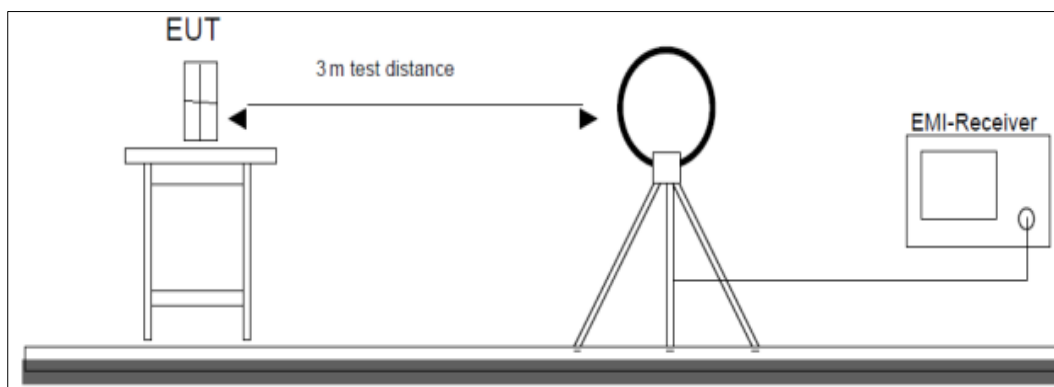


Figure 1: Frequency Range 9 kHz- 30 MHz

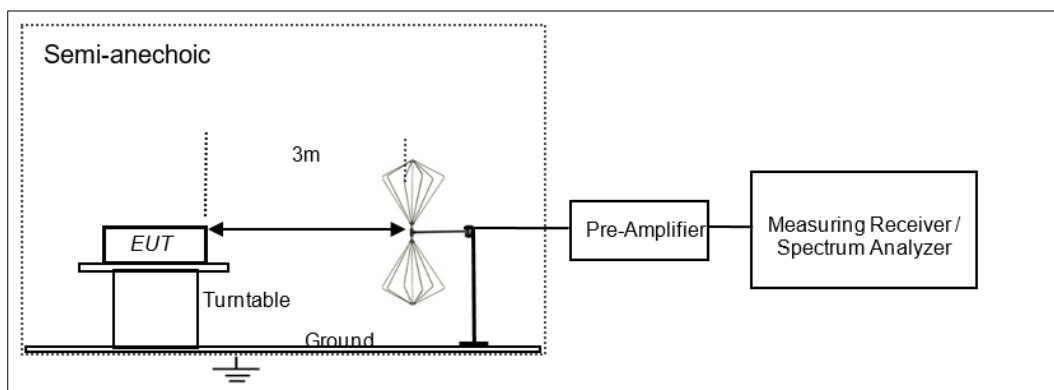


Figure 2: Frequency Range 30 MHz – 200 MHz

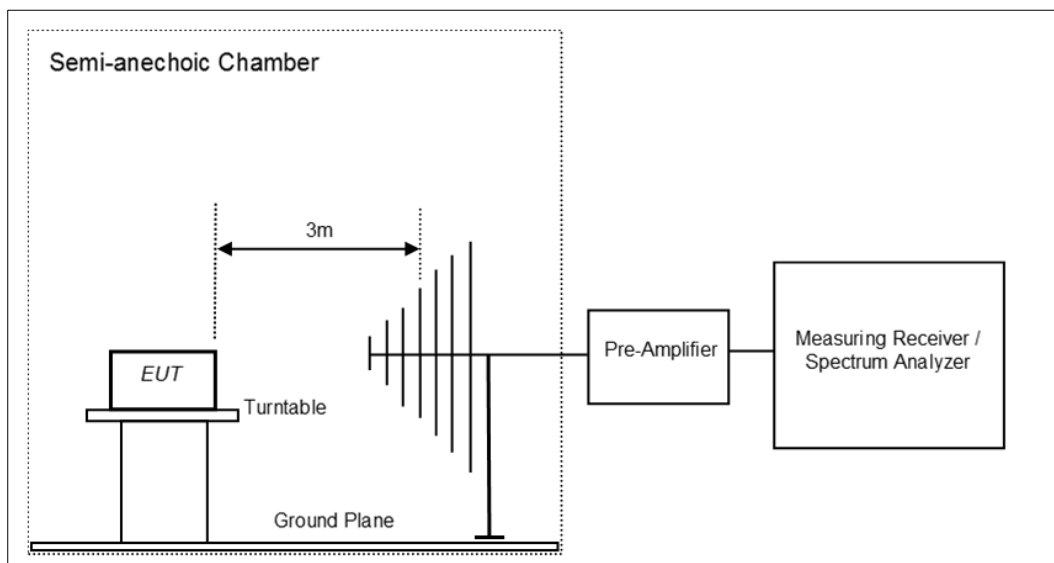


Figure 3: Frequency Range 200 MHz - 1GHz

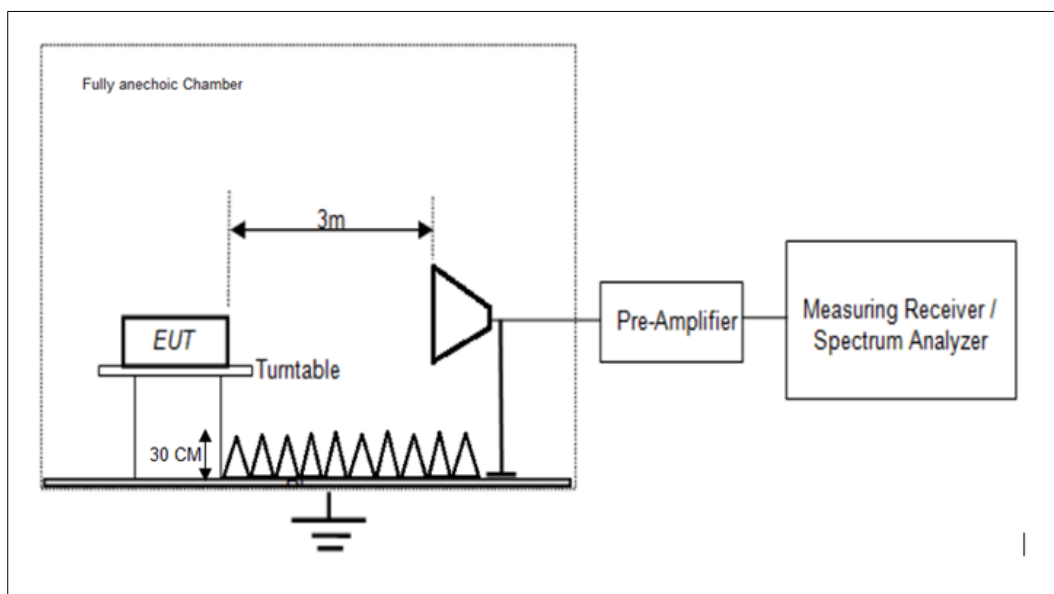


Figure 4: Frequency Range above 1 GHz

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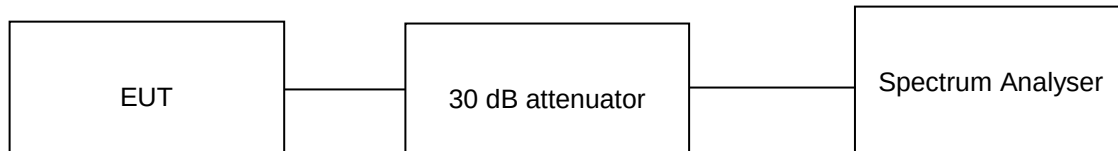
7 TEST RESULTS

7.1 Maximum Peak Conducted Output Power

Result

Pass

Test Specification	FCC part 15 Subpart C 15.247 (b)(2) RSS-247 issue 2 5.4 (a)
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) = + 22.1 °C Voltage = 3.3V DC through AC/DC Adapter Relative humidity: 65%

KDB Guidelines applied:

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

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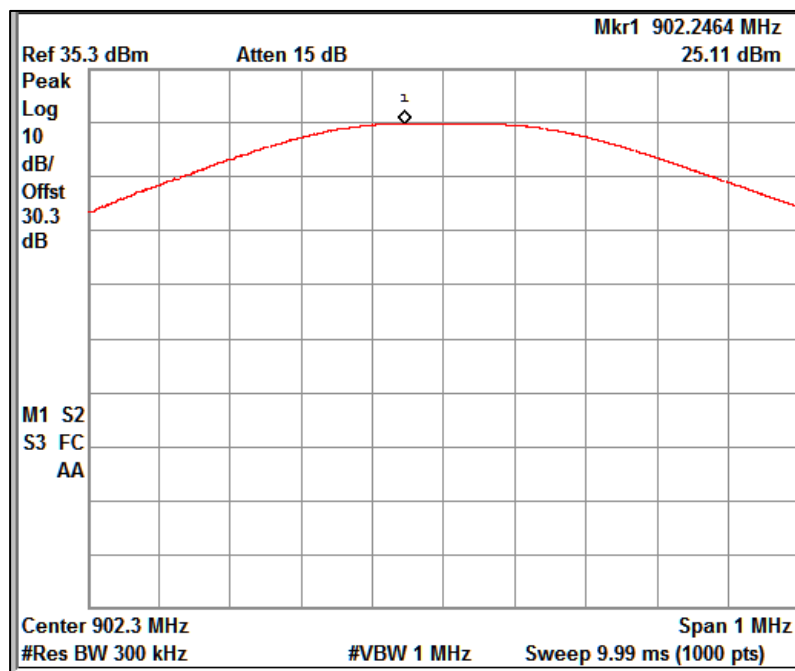
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Test results:

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 (30dB) + Cable loss (0.3dB)
3. This product do not support additional beamforming gain / directional gain, it uses single antenna and hence Directional gain of the single antenna is 3.5 dBi

Data Rate (kbps)	Channel Frequency (MHz)	Measured Peak Output Power (dBm)	Antenna Gain (dBi)	Measured e.i.r.p (dBm)	Power Limit (dBm)	e.i.r.p Limit (dBm)
125	902.3	25.11	3.5	28.61	30	36
	908.5	25.27	3.5	28.77	30	36
	914.9	24.38	3.5	27.88	30	36



Channel Frequency: 902.3MHz

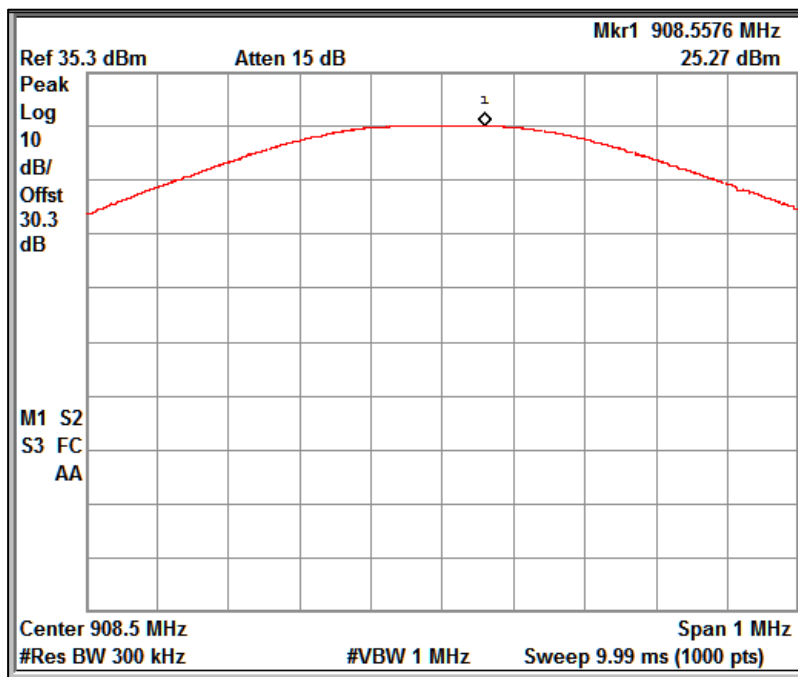
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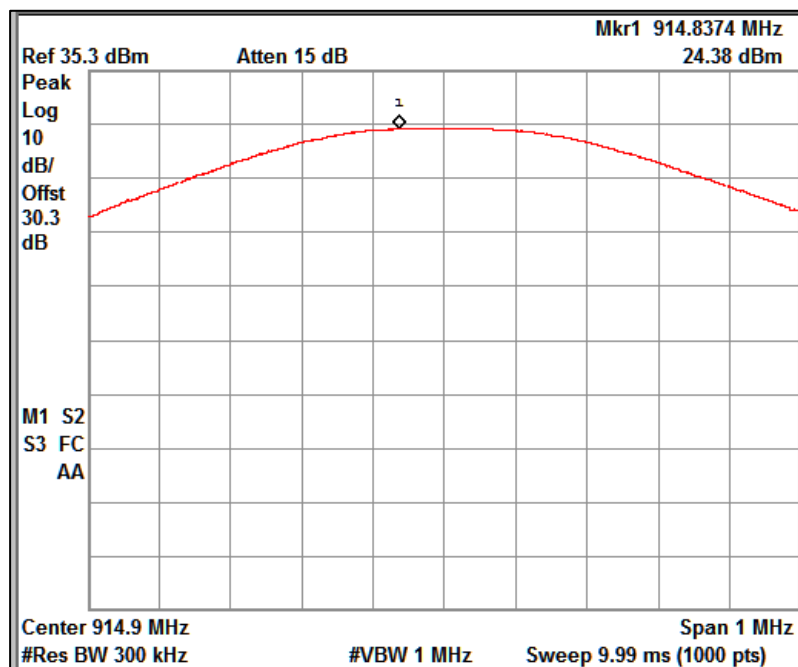
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Channel Frequency: 908.5MHz



Channel Frequency: 914.9MHz

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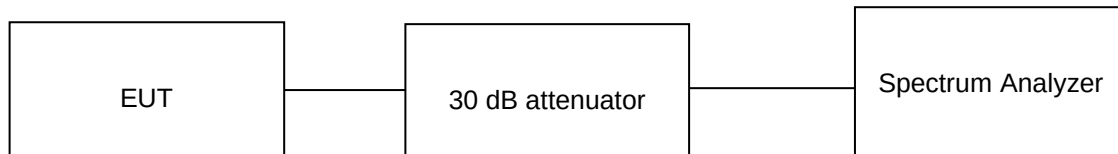
7.2 Occupied bandwidth

Result

Pass

Test Specification	FCC part 15 Subpart C 15.247 (a) (i) RSS-247 issue 2 5.1 (c)
Test Method	Subclause 7.8.7 of ANSI C63.10
Measurement Bandwidth	3 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) = + 22.1 °C Voltage = 3.3V DC through AC/DC Adapter Relative humidity: 65%

KDB Guidelines applied:

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

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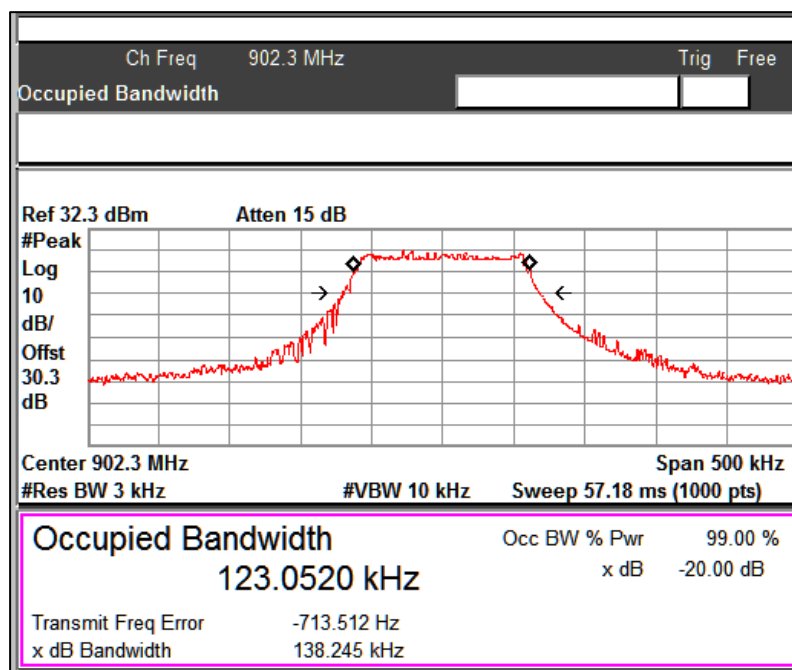
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Test results:

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 (0.3dB)
3. This product do not support additional beamforming gain / directional gain, it uses single antenna and hence Directional gain of the single antenna is 3.5 dBi.

Data Rate (kbps)	Channel Frequency (MHz)	20 dB Bandwidth (kHz)	99% OBW (kHz)	Minimum Limit (kHz)
125	902.3	138.24	123.05	250
	908.5	133.82	121.01	250
	914.9	134.53	122.68	250

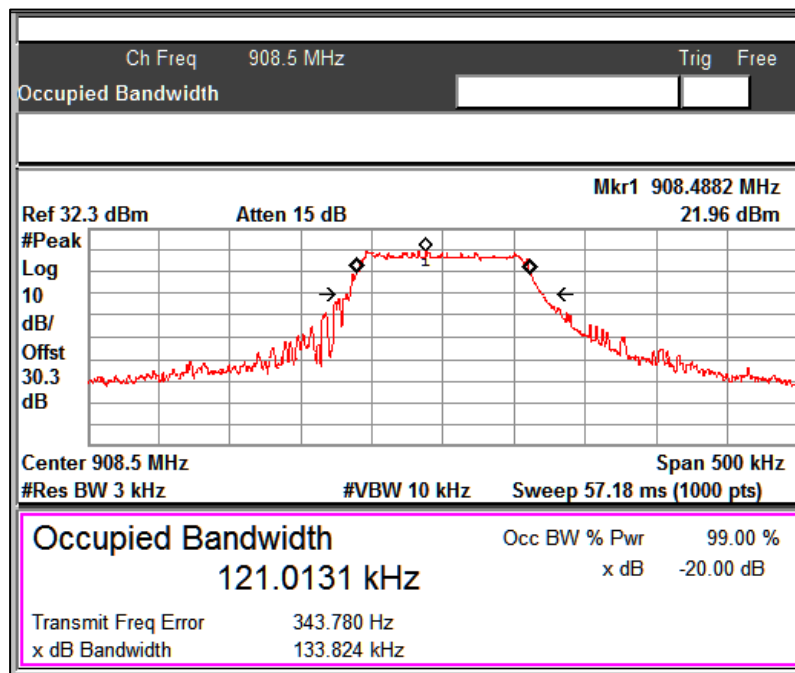


Channel Frequency: 902.3MHz

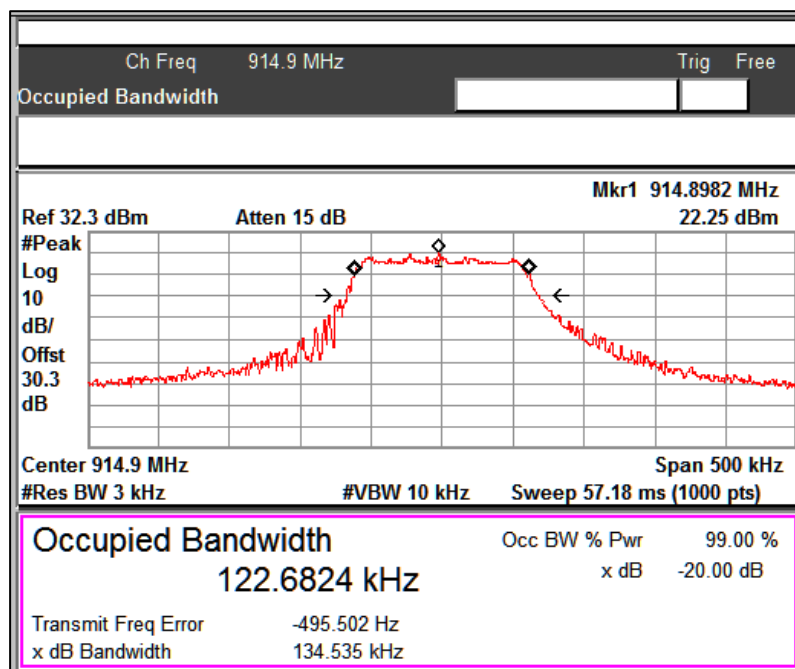
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Channel Frequency: 908.5MHz



Channel Frequency: 914.9MHz

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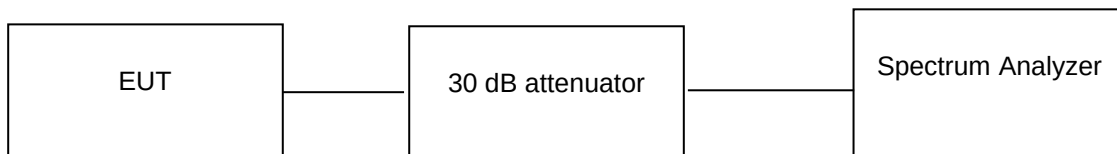
7.3 Number of Hopping Channels

Result

Pass

Test Specification	FCC Part 15 Subpart C Section 15.247 (a) (i) RSS-247 issue 2 5.1 (c)
Test Method	Subclause 7.8.3 of ANSI C63.10
Measurement Bandwidth	30 kHz*
Detector	Peak
Port of testing	Antenna port
Requirement	Frequency hopping systems operating in the band 902.2-928 MHz shall use at least 50 hopping channels if the minimum 20 dB bandwidth is less than 250 kHz.

Test Method:



*Note: RBW setting of 30 kHz is used because setting of 60 kHz (30% of 20 dB bandwidth) bandwidth in the Spectrum Analyser is not supported

Test Condition

Normal Test Condition:

Temperature (Norm) = + 22.1 °C Voltage = 3.3V DC through AC/DC Adapter Relative humidity: 65%

KDB Guidelines applied:

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

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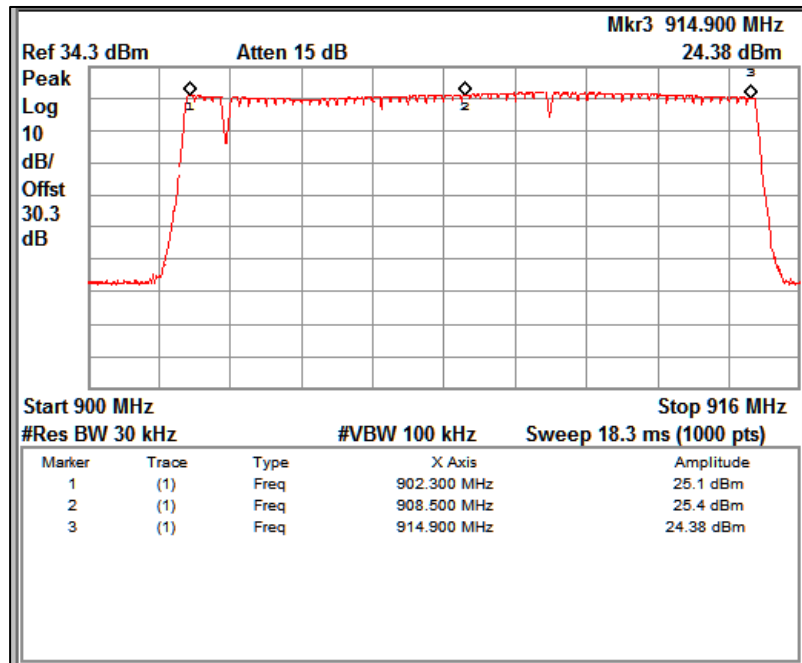
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Test results:

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 (30dB) + Cable loss (0.3dB).



Number of Hopping Frequencies

Start hopping Frequency Observed 902.3 MHz
Stop hopping Frequency Observed 914.9 MHz

Total Number of Hopping Channels Observed = 64

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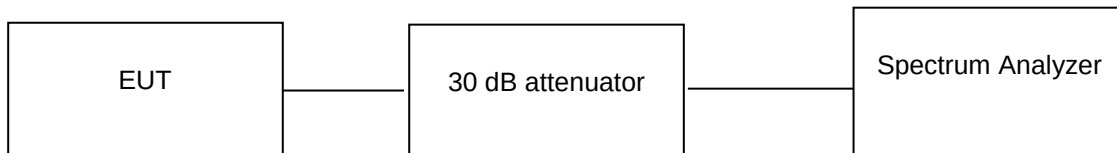
7.4 Carrier Frequency Separation

Result

Pass

Test Specification	FCC Part 15 Subpart C Section 15.247 (a) (1) RSS-247 issue 2 5.1 (b)
Test Method	Clause 7.8.2 of ANSI C63.10
Measurement Bandwidth	30kHz
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) = + 22.1 °C Voltage = 3.3V DC through AC/DC Adapter Relative humidity: 65%

KDB Guidelines applied:

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

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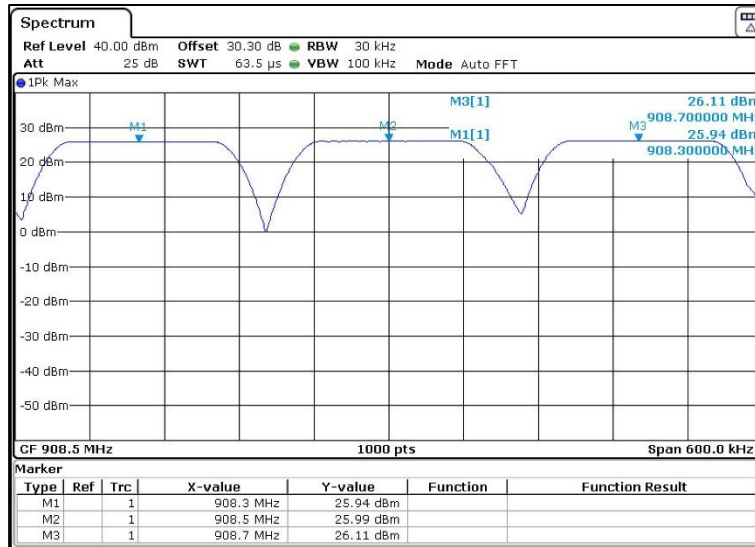
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Test results:

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 (30dB) + Cable loss (0.3dB)
3. This product do not support additional beamforming gain / directional gain, it uses single antenna and hence Directional gain of the single antenna is 3.5 dBi.



Frequency (MHz)	Channel spacing Observed (KHz)
908.3	200
908.5	200
908.7	200

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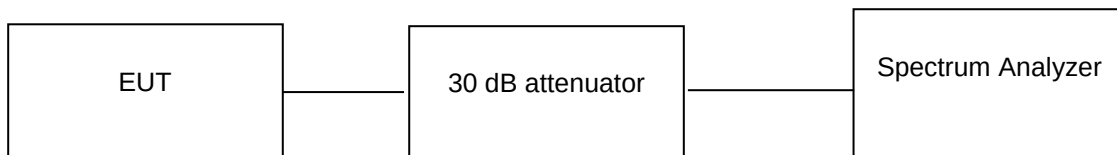
7.5 Time of Occupancy (Dwell Time)

Result

Pass

Test Specification	FCC Part 15 Subpart C Section 15.247 (a) (i) RSS-247 issue 2 5.1 (c)
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) = + 22.1 °C Voltage = 3.3V DC Through AC/DC Adapter Relative humidity: 65%

KDB Guidelines applied:

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

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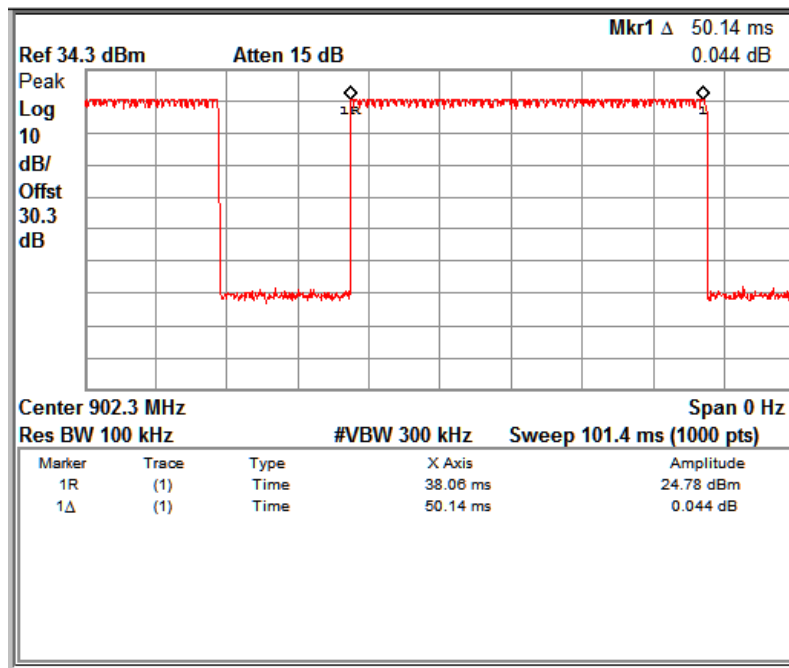
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Test results:

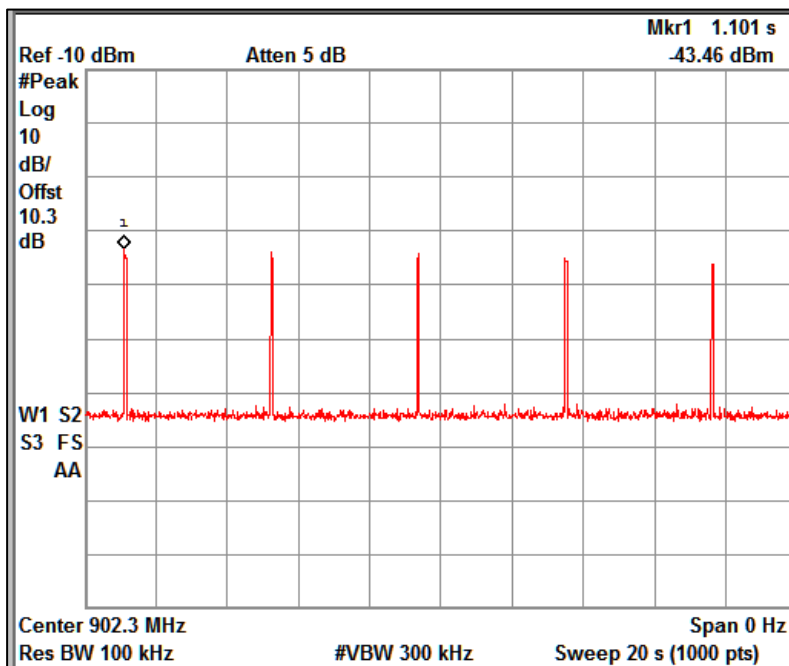
Note:

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 (30dB) + Cable loss (0.3dB)



Dwell Time

Note: for below Graph 10dB attenuator used



Number of Bins

Dwell Time = 50.14ms
Total bins in 20 Sec = 05
Max. Allowed time = 0.4s

Total time occupancy in 20s = 50.14 * 05 = 250.7ms (which is less than 400ms)

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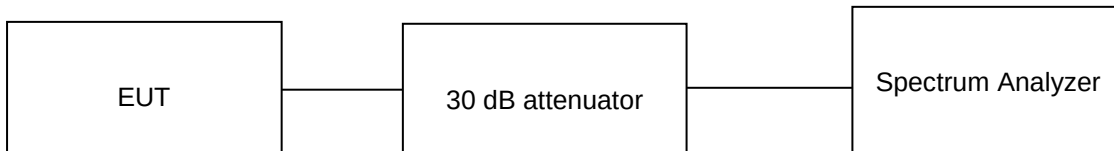
7.6 Emissions in non-restricted frequency bands and Conducted Spurious Emission

Result

Pass

Test Specification	FCC part 15 Subpart C 15.247 (d) RSS-247 issue 2 5.5
Test Method	Subclause 7.8.8 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) = + 22.1 °C Voltage = 3.3V DC Battery Supply Relative humidity: 65%

KDB Guidelines applied:

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

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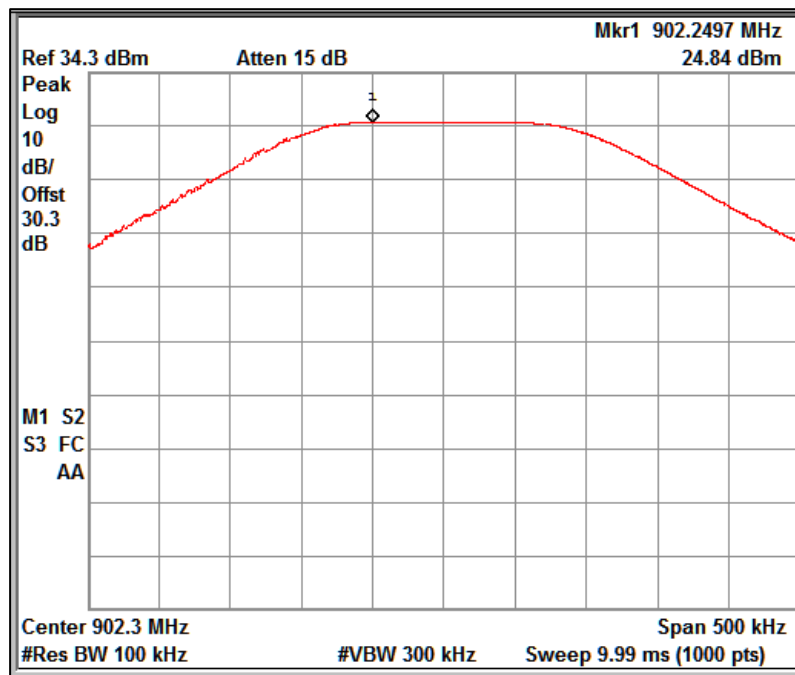
Test results:

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 (0.3dB)
3. This product do not support additional beamforming gain / directional gain, it uses single antenna and hence Directional gain of the single antenna is 3.5 dBi
4. Only worst case results are reported

7.6.1 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)
125	902.3	24.84	902	0.27	-24.57	-20.00
125	914.9	24.18	928	-34.77	-58.95	-20.00

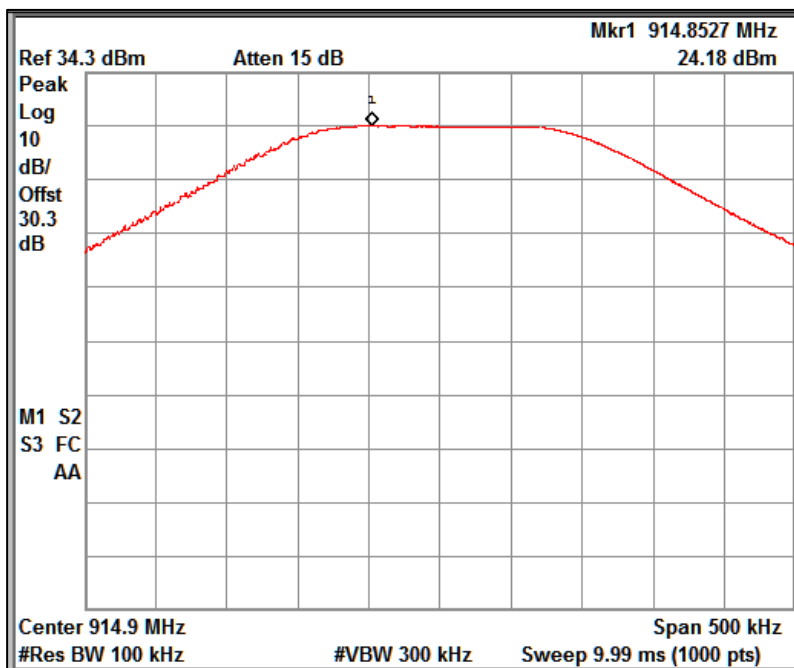


Reference plot for 902.3MHz

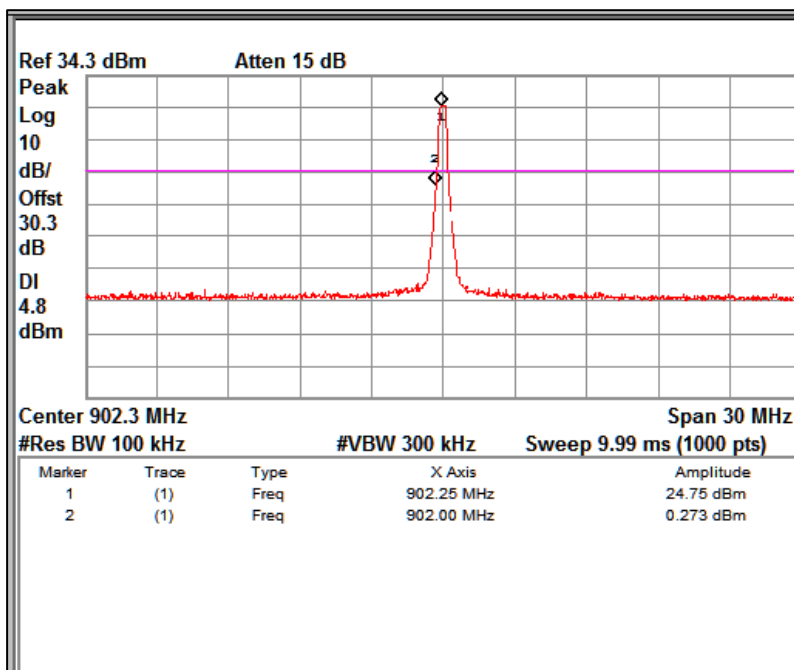
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Reference plot for 914.9MHz

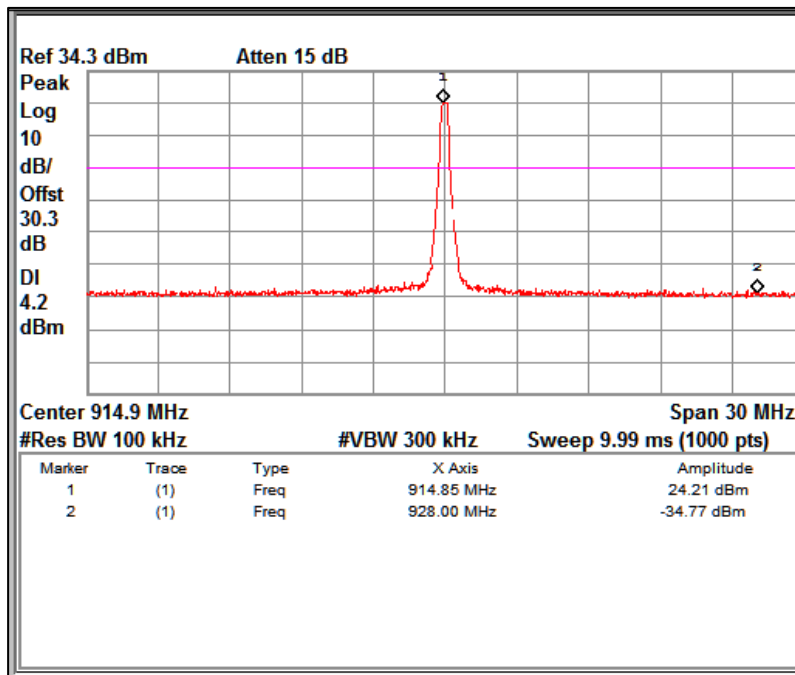


Band edge Channel Frequency 902.3MHz

Prüfbericht - Nr.:
Test Report No.:

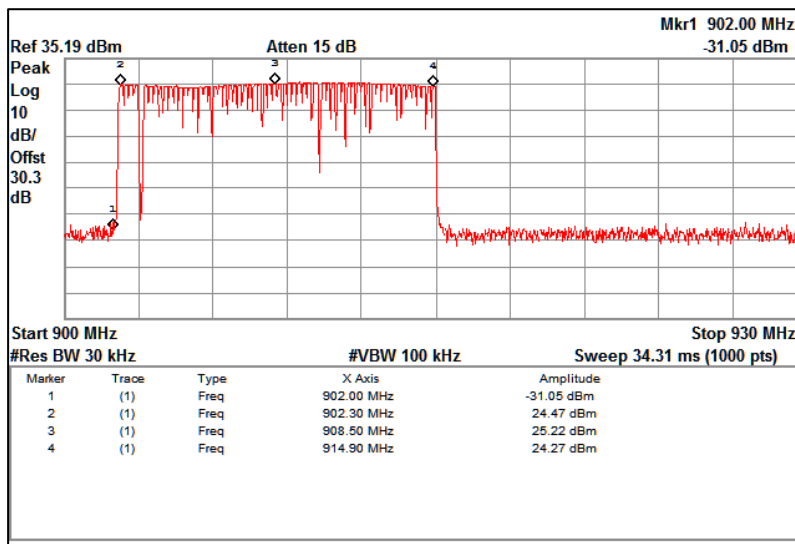
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Band edge Channel Frequency 914.9MHz

Device in Hopping Mode:

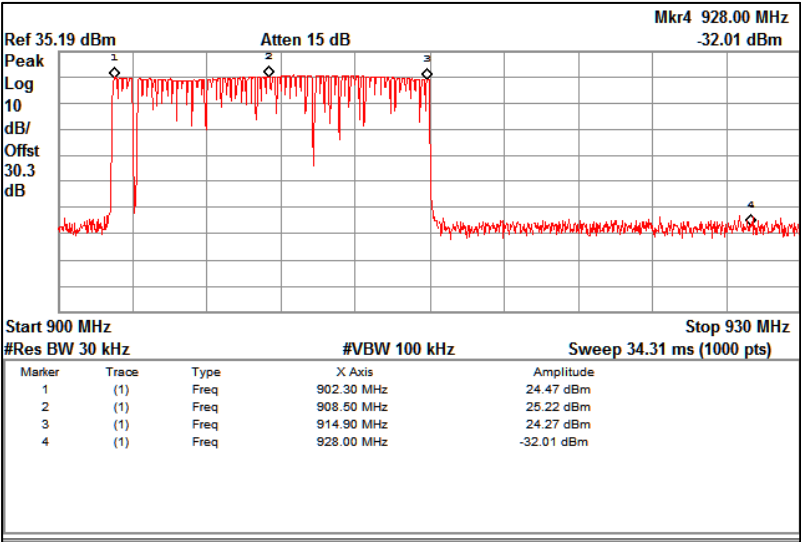


Hopping Frequency low Band edge

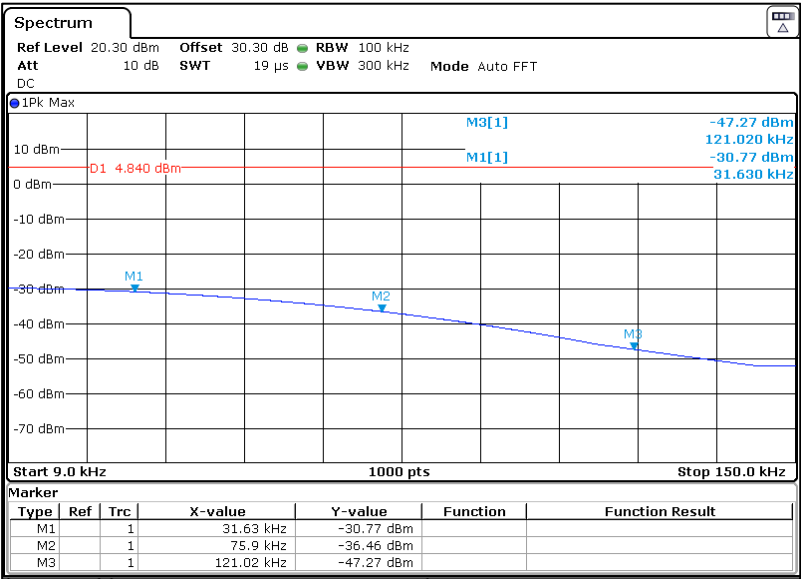
Prüfbericht - Nr.:
Test Report No.:

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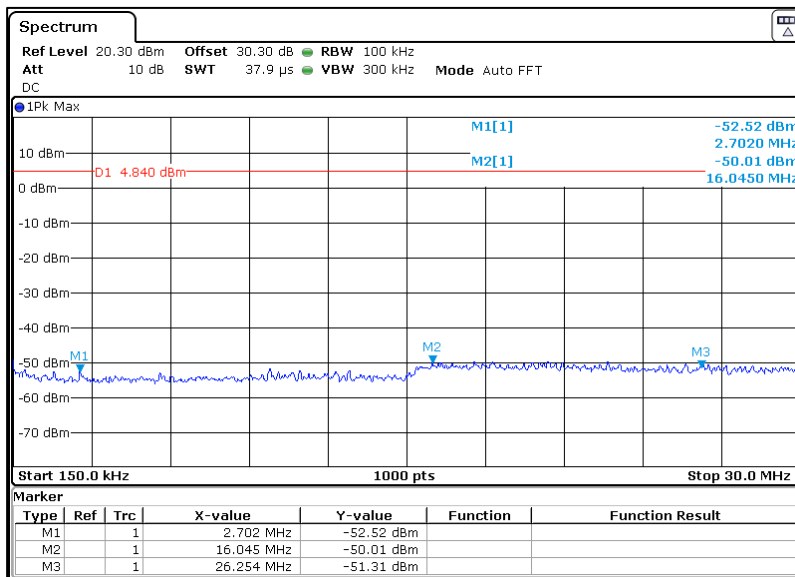
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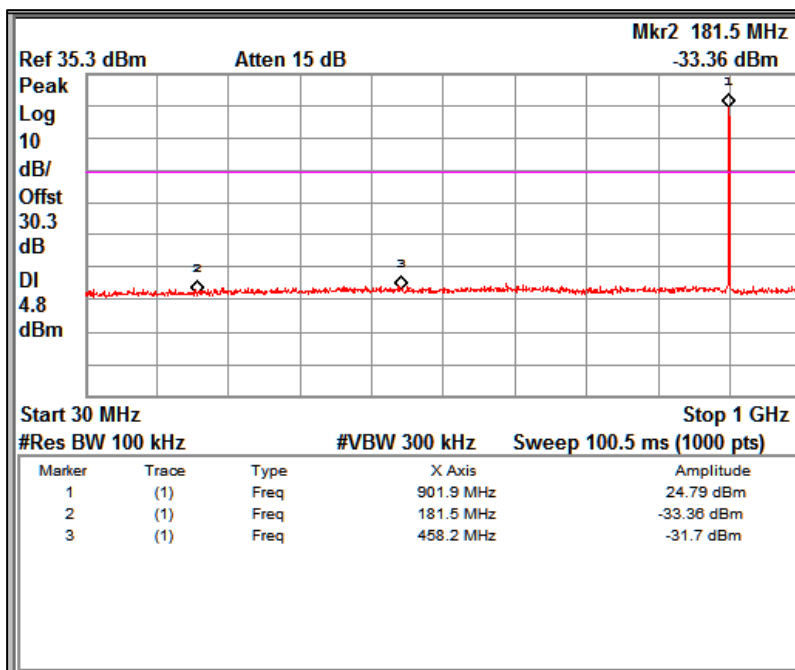
7.6.2 Out-Of-Band Emissions



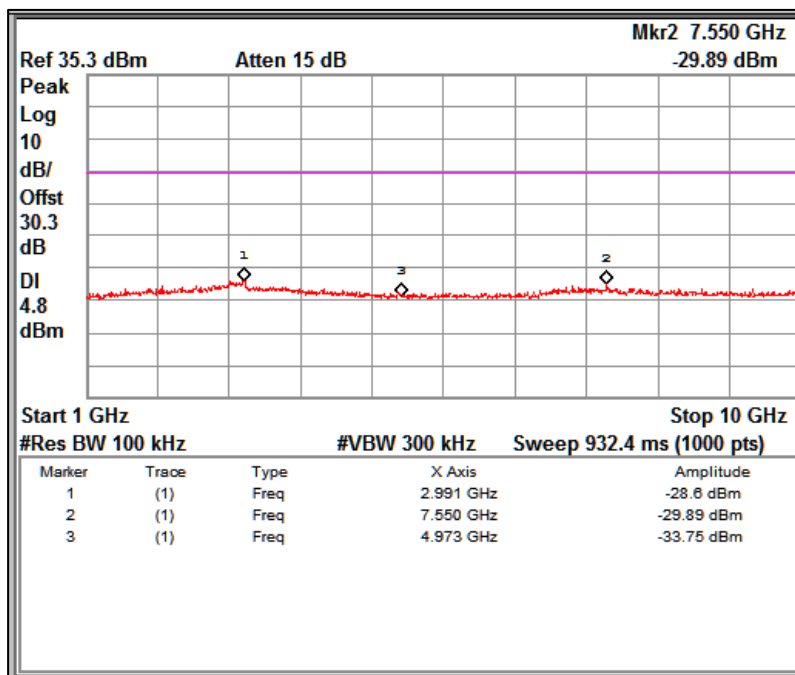
Channel Frequency 902.3MHz Frequency Range 9KHz – 150KHz



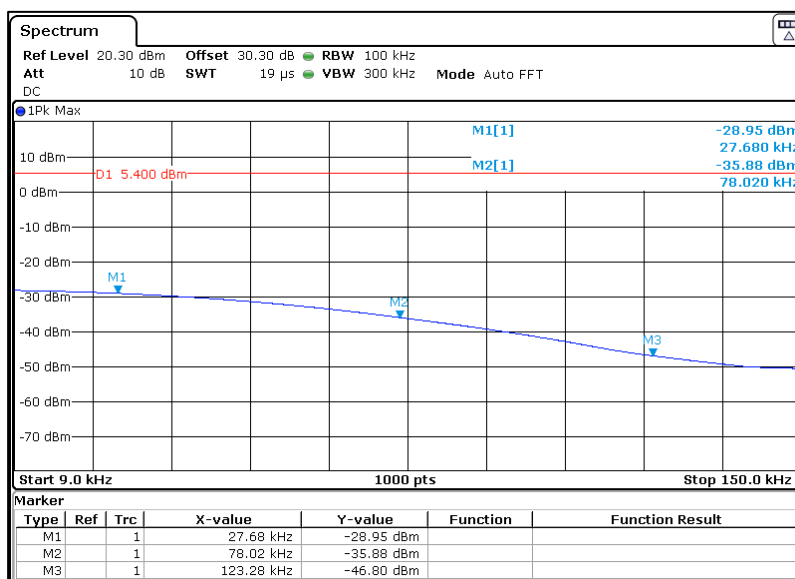
Channel Frequency 902.3MHz Frequency Range 150KHz – 30MHz



Channel Frequency 902.3MHz Frequency Range 30MHz – 1GHz



Channel Frequency 902.3MHz Frequency Range 1GHz – 10GHz

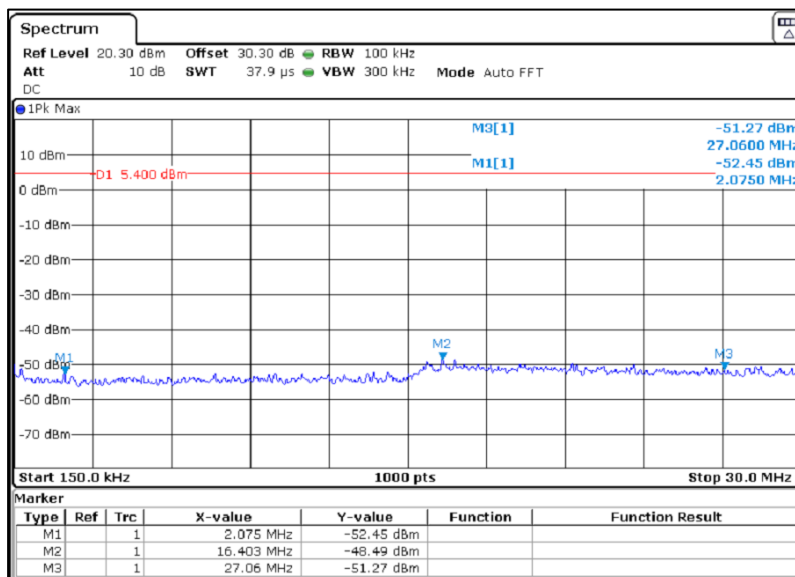


Channel Frequency 908.5MHz	Frequency Range 9KHz – 150KHz
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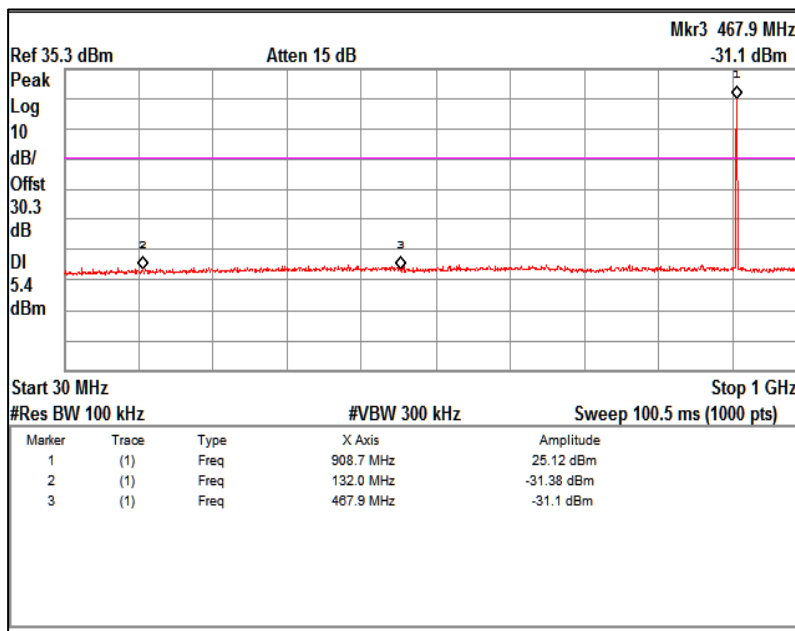
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Channel Frequency 908.5MHz Frequency Range 150KHz – 30MHz

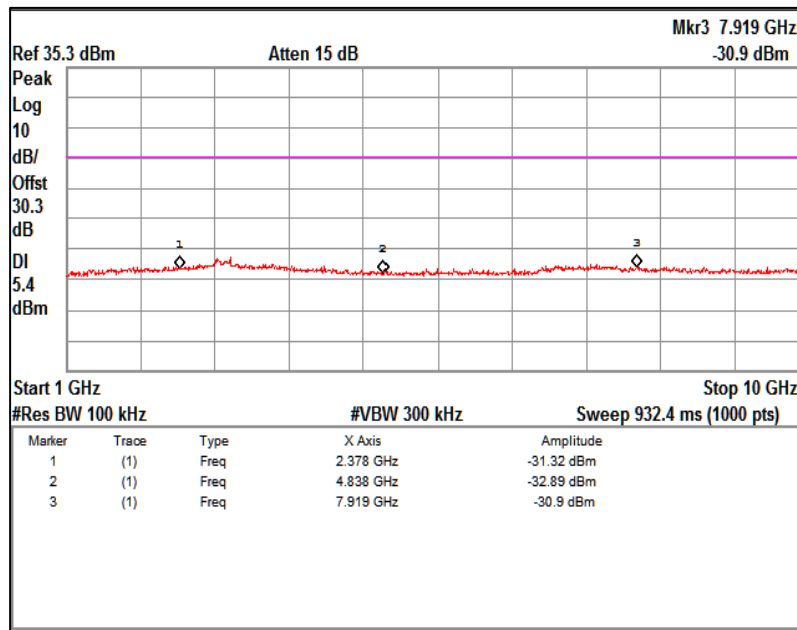


Channel Frequency 908.5MHz Frequency Range 30MHz – 1GHz

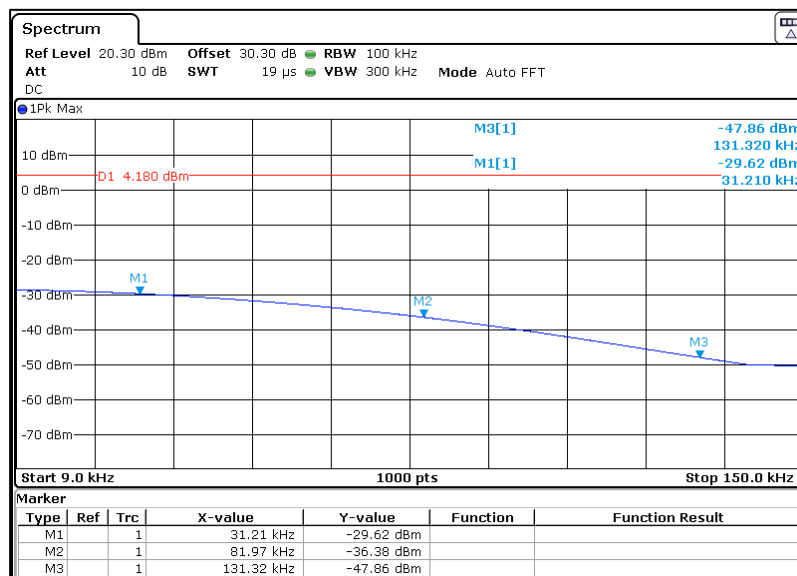
Prüfbericht - Nr.:
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Channel Frequency 908.5MHz Frequency Range 1GHz – 10GHz

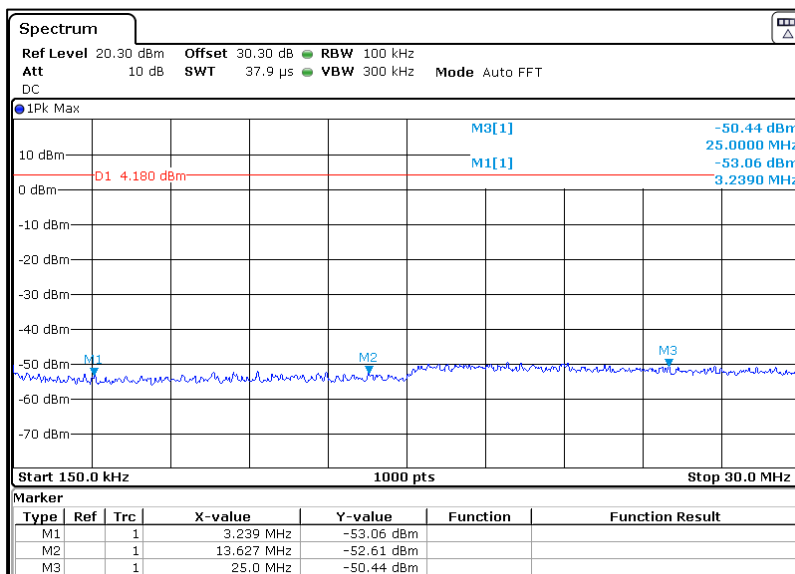


Channel Frequency 914.9MHz Frequency Range 9KHz – 150KHz

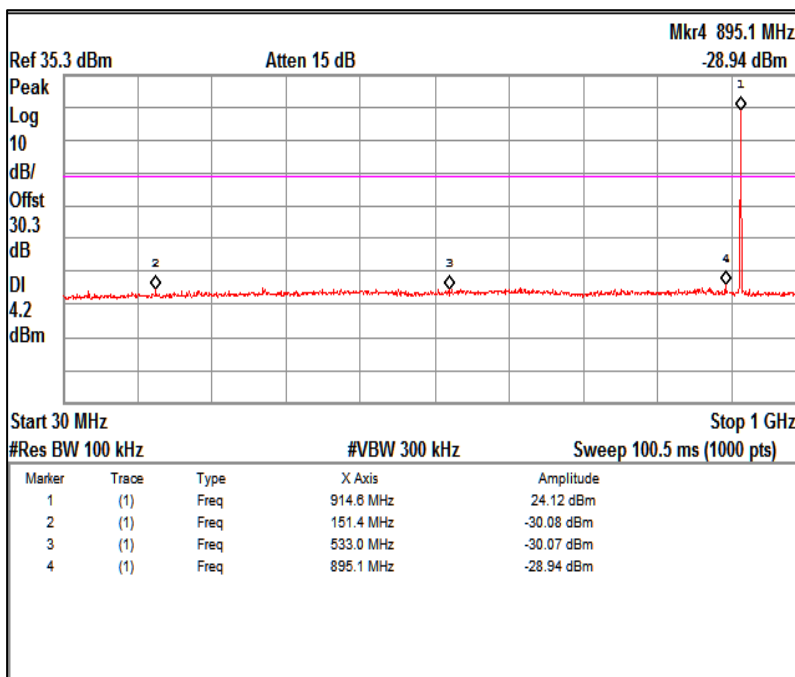
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Channel Frequency 914.9MHz Frequency Range 150KHz – 30MHz

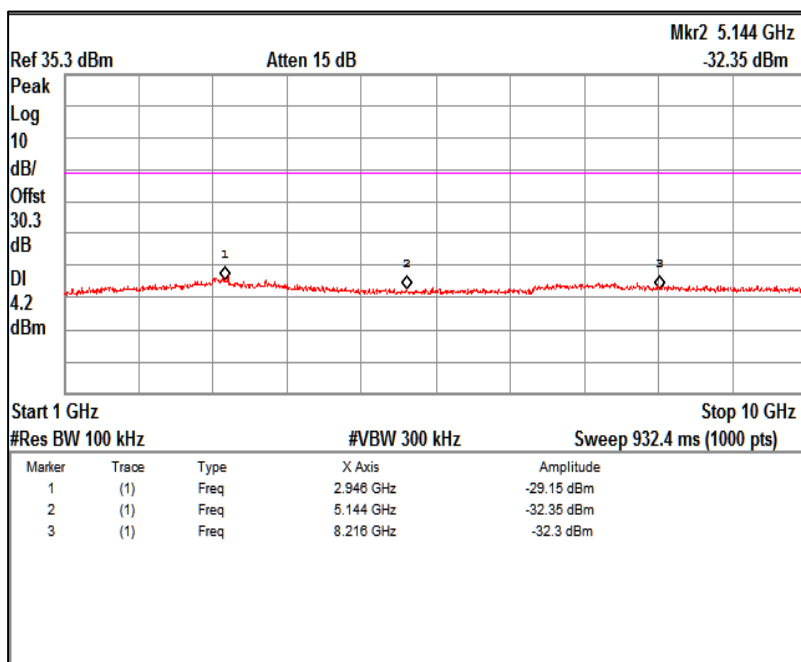


Channel Frequency 914.9MHz Frequency Range 30MHz – 1GHz

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Channel Frequency 914.9MHz Frequency Range 1GHz – 10GHz

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7.7 Spurious Radiated Emissions & Restricted Bands of Operation

Result

Pass

Test Specification	FCC part 15 Subpart C 15.247 (d) / (15.209 & 15.205) RSS-GEN issue 5 clause 8.9, 8.10
Test Method	ANSI C63.10
Measurement Location	Semi Anechoic Chamber 9kHz - 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) = + 19.5 °C Voltage = 3.3V through AC/DC Adapter Relative humidity: 63%

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Test results:

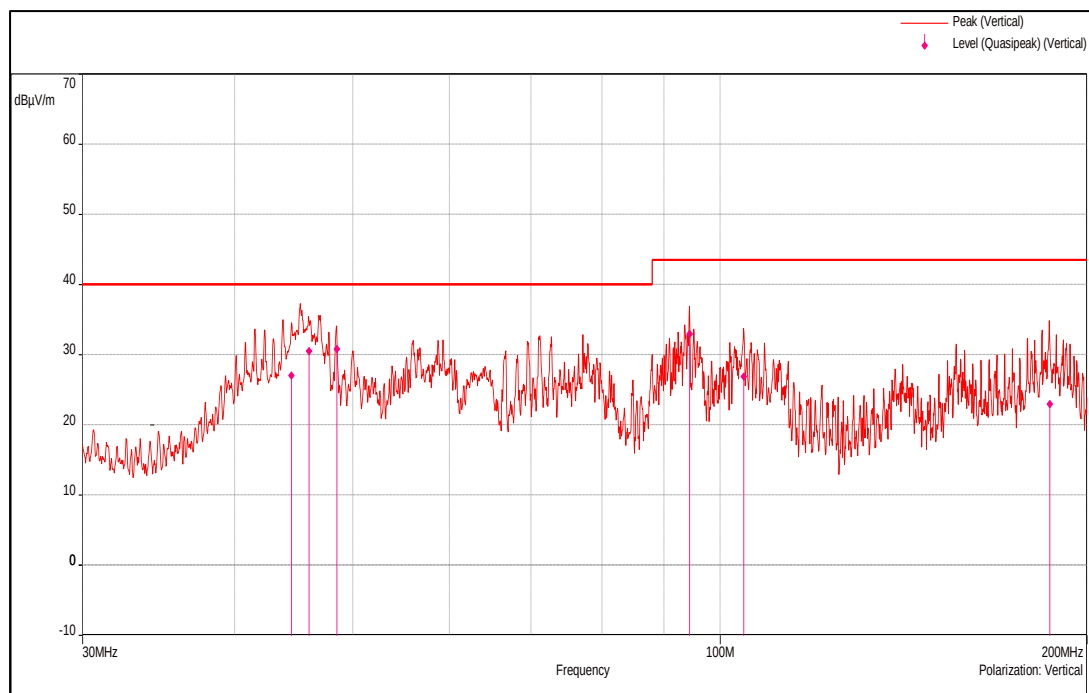
Note: All the losses are included during measurement and final values are mentioned in the test report. Refer TEST METHODOLOGY for more details

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

Table 7: Test results for frequency range 30MHz – 200MHz

Antenna Polarization	Measured Frequency (MHz)	Measured Emission (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
Vertical	44.48(Qp)	27.05	40.00	-12.95
	48.49(Qp)	30.80	40.00	-9.20
	104.57(Qp)	26.91	43.50	-16.59
	186.40(Qp)	23.00	43.50	-20.50
Horizontal	48.48(Pk)	18.00	40.00	-22.00
	94.41(Pk)	23.90	43.50	-19.60
	156.24(Pk)	30.10	43.50	-13.40
	186.36(Pk)	33.40	43.50	-10.10



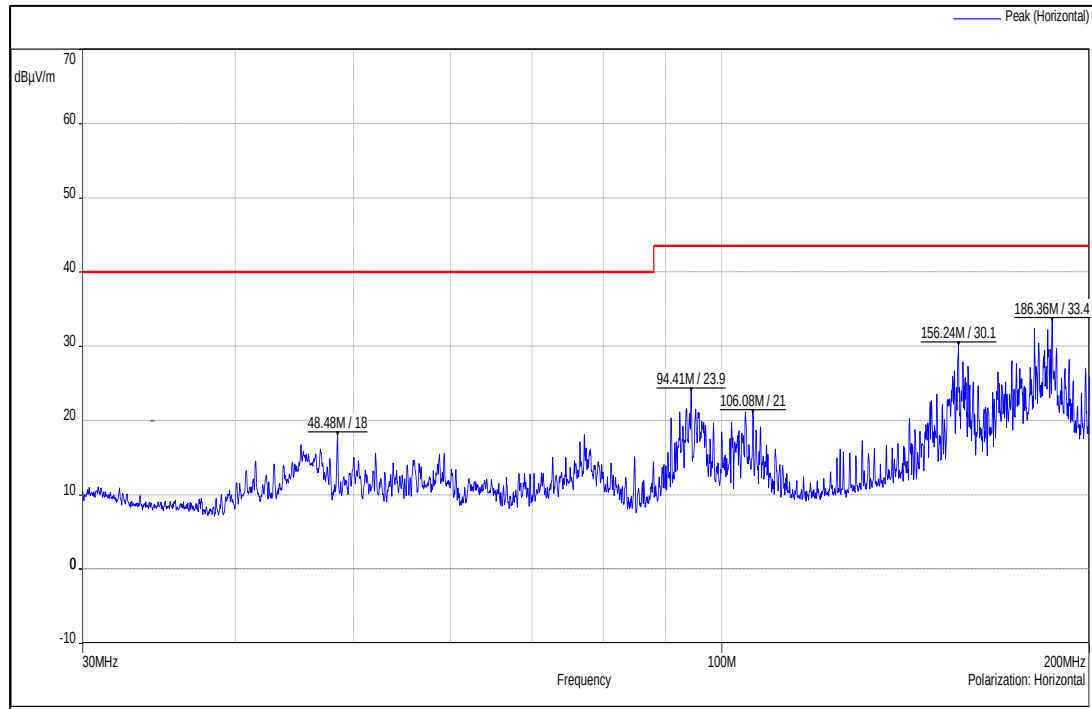
Channel Frequency 30MHz – 200MHz

Polarization Vertical

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Channel Frequency 30MHz – 200MHz

Polarization Horizontal

Table 8: Test results for frequency range 200MHz – 1GHz

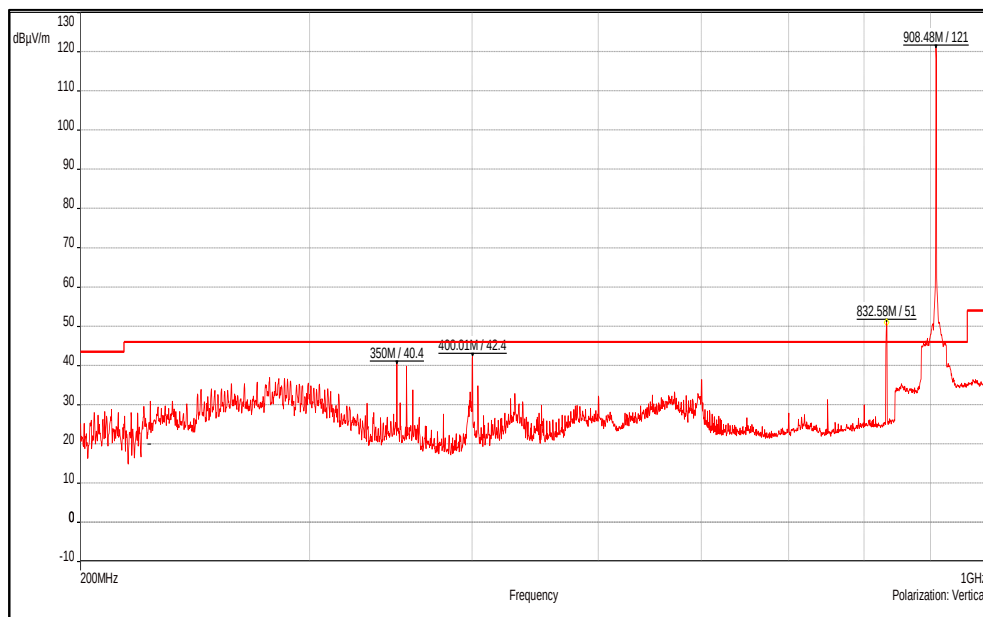
Antenna Polarization	Frequency (MHz)	Measured Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Vertical	350.00(Pk)	40.40	46.00	-5.60
	400.00(Pk)	42.40	46.00	-3.60
	832.58(QP)	41.30	46.00	-4.70
	908.48(Pk)	121.00	-	*
Horizontal	305.06(Pk)	35.40	46.00	-10.6
	350.00(Pk)	39.30	46.00	-6.7
	400.01(Pk)	37.70	46.00	-8.3
	500.00(Pk)	33.00	46.00	-13
	908.45(Pk)	120.00	-	*

Note: -* indicates the Nominal Frequency of a device

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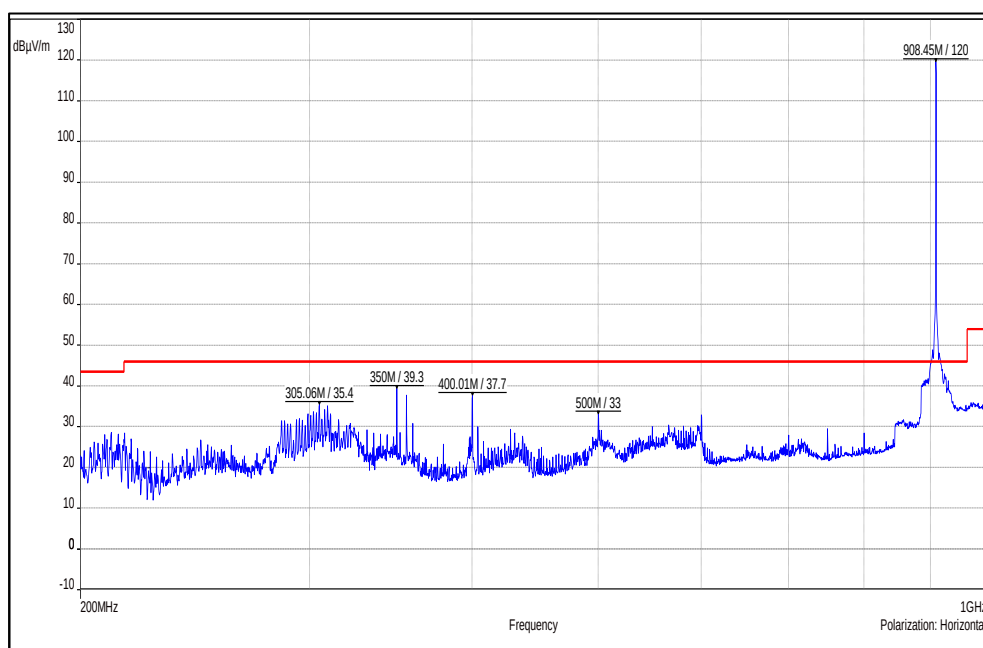
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Channel Frequency 200MHz – 1GHz

Polarization Vertical



Channel Frequency 200MHz – 1GHz

Polarization Horizontal

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Table 9: Test results for the frequencies above 1GHz:

Channel Frequency: 902.3MHz

Channel Frequency (MHz)	Frequency (MHz)	Polarization	Measured Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
902.3	1804.6(Pk)	Vertical	51.74	74.00	-22.26
	1804.6(Av)		49.68	54.00	-4.32
	2706.9(Pk)		43.55	74.00	-30.45
	2706.9(Av)		40.21	54.00	-13.79
	3609.2(Pk)		45.74	74.00	-28.26
	3609.2(Av)		41.52	54.00	-12.48
	4511.5(Pk)		54.22	74.00	-19.78
	4511.5(Av)		51.77	54.00	-2.23
	5413.8(Pk)		38.59	74.00	-35.41
	5413.8(Av)		26.26	54.00	-27.74
	6316.1(Pk)		53.25	74.00	-20.75
	6316.1(Av)		48.02	54.00	-5.98
	7218.4(Pk)		54.48	74.00	-19.52
	7218.4(Av)		49.38	54.00	-4.62
	8120.7(Pk)		54.12	74.00	-19.88
	8120.7(Av)		47.67	54.00	-6.33
	9023(Pk)		54.93	74.00	-19.07
	9023(Av)		47.69	54.00	-6.31
	1804.6(Pk)	Horizontal	39.42	74.00	-34.58
	1804.6(Av)		34.4	54.00	-19.60
	2706.9(Pk)		38.48	74.00	-35.52
	2706.9(Av)		29.56	54.00	-24.44
	3609.2(Pk)		40.8	74.00	-33.20
	3609.2(Av)		30.42	54.00	-23.58
	4511.5(Pk)		42.56	74.00	-31.44
	4511.5(Av)		30.52	54.00	-23.48
	5413.8(Pk)		38.7	74.00	-35.30
	5413.8(Av)		26.24	54.00	-27.76
	6316.1(Pk)		48.46	74.00	-25.54
	6316.1(Av)		41.45	54.00	-12.55
	7218.4(Pk)		48.09	74.00	-25.91
	7218.4(Av)		35.35	54.00	-18.65
	8120.7(Pk)		48.53	74.00	-25.47
	8120.7(Av)		36.38	54.00	-17.62
	9023(Pk)		50.5	74.00	-23.50
	9023(Av)		38.91	54.00	-15.09

Pk: Peak Detector;
Av: Average Detect

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Channel Frequency: 908.5MHz

Channel Frequency (MHz)	Frequency (MHz)	Polarization	Measured Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
908.5	1817(Pk)	Vertical	54.66	74.00	-19.34
	1817(Av)		50.33	54.00	-3.67
	2725.5(Pk)		45.52	74.00	-28.48
	2725.5(Av)		42.81	54.00	-11.19
	3636(Pk)		45.24	74.00	-28.76
	3634(Av)		40.00	54.00	-14.00
	4542.5(Pk)		55.54	74.00	-18.46
	4542.5(Av)		51.33	54.00	-2.67
	5451(Pk)		40.12	74.00	-33.88
	5451(Av)		27.72	54.00	-26.28
	6359.5(Pk)		50.45	74.00	-23.55
	6359.5(Av)		43.85	54.00	-10.15
	7268(Pk)		53.95	74.00	-20.05
	7268(Av)		48.40	54.00	-5.60
	8176.5(Pk)		52.72	74.00	-21.28
	8176.5(Av)		44.19	54.00	-9.81
	9085(Pk)		56.77	74.00	-17.23
	9085(Av)		48.85	54.00	-5.15
	1817(Pk)	Horizontal	45.34	74.00	-28.66
	1817(Av)		39.91	54.00	-14.09
	2725.5(Pk)		46.17	74.00	-27.83
	2725.5(Av)		41.6	54.00	-12.40
	3636(Pk)		44.25	74.00	-29.75
	3634(Av)		38.96	54.00	-15.04
	4542.5(Pk)		48.12	74.00	-25.88
	4542.5(Av)		43.31	54.00	-10.69
	5451(Pk)		40.45	74.00	-33.55
	5451(Av)		27.46	54.00	-26.54
	6359.5(Pk)		45.9	74.00	-28.10
	6359.5(Av)		35.3	54.00	-18.70
	7268(Pk)		49.45	74.00	-24.55
	7268(Av)		36.91	54.00	-17.09
	8176.5(Pk)		50.64	74.00	-23.36
	8176.5(Av)		37.49	54.00	-16.51
	9085(Pk)		54.25	74.00	-19.75
	9085(Av)		40.97	54.00	-13.03

Pk: Peak Detector;
Av: Average Detector

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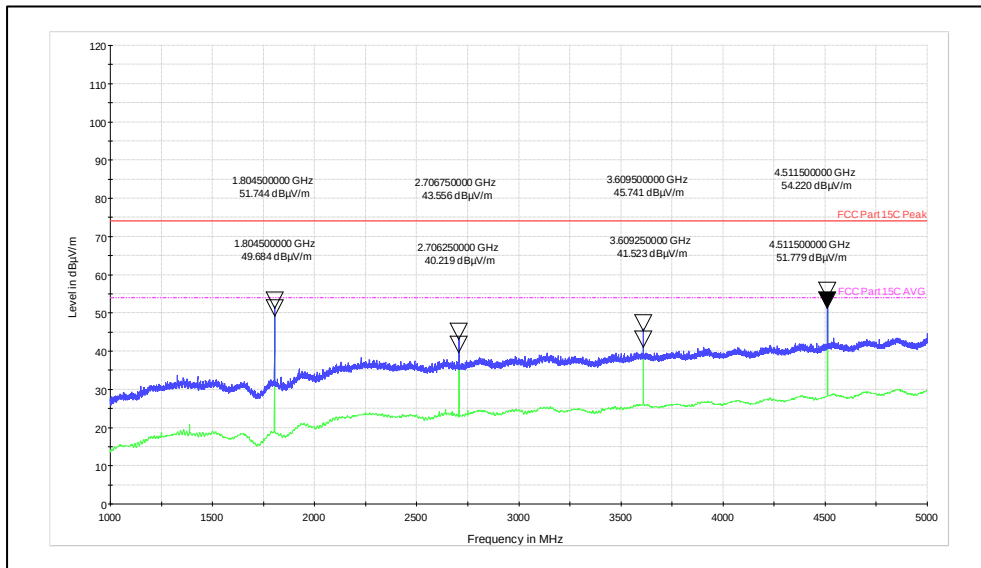
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Channel Frequency: 914.9MHz

Channel Frequency (MHz)	Frequency (MHz)	Polarization	Measured Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
914.9	1829.8(Pk)	Vertical	54.02	74.00	-19.98
	1829.8(Av)		52.54	54.00	-1.46
	2744.7(Pk)		44.31	74.00	-29.69
	2744.7(Av)		40.30	54.00	-13.70
	3659.6(Pk)		45.40	74.00	-28.60
	3659.6(Av)		38.76	54.00	-15.24
	4574.5(Pk)		48.04	74.00	-25.96
	4574.5(Av)		43.77	54.00	-10.23
	5489.4(Pk)		40.85	74.00	-33.15
	5489.4(Av)		28.00	54.00	-26.00
	6404.3(Pk)		50.16	74.00	-23.84
	6404.3(Av)		43.53	54.00	-10.47
	7319.2(Pk)		55.52	74.00	-18.48
	7319.2(Av)		49.69	54.00	-4.31
	8234.1(Pk)		54.86	74.00	-19.14
	8234.1(Av)		48.19	54.00	-5.81
	9149(Pk)		56.16	74.00	-17.84
	9149(Av)		46.69	54.00	-7.31
	1829.8(Pk)	Horizontal	45.51	74.00	-28.49
	1829.8(Av)		43.5	54.00	-10.50
	2744.7(Pk)		45.23	74.00	-28.77
	2744.7(Av)		41.61	54.00	-12.39
	3659.6(Pk)		43.54	74.00	-30.46
	3659.6(Av)		38.5	54.00	-15.50
	4574.5(Pk)		45.54	74.00	-28.46
	4574.5(Av)		39.46	54.00	-14.54
	5489.4(Pk)		40.64	74.00	-33.36
	5489.4(Av)		27.98	54.00	-26.02
	6404.3(Pk)		44.99	74.00	-29.01
	6404.3(Av)		33.47	54.00	-20.53
	7319.2(Pk)		48.57	74.00	-25.43
	7319.2(Av)		36.4	54.00	-17.60
	8234.1(Pk)		50.21	74.00	-23.79
	8234.1(Av)		37.42	54.00	-16.58
	9149(Pk)		53.83	74.00	-20.17
	9149(Av)		41.34	54.00	-12.66

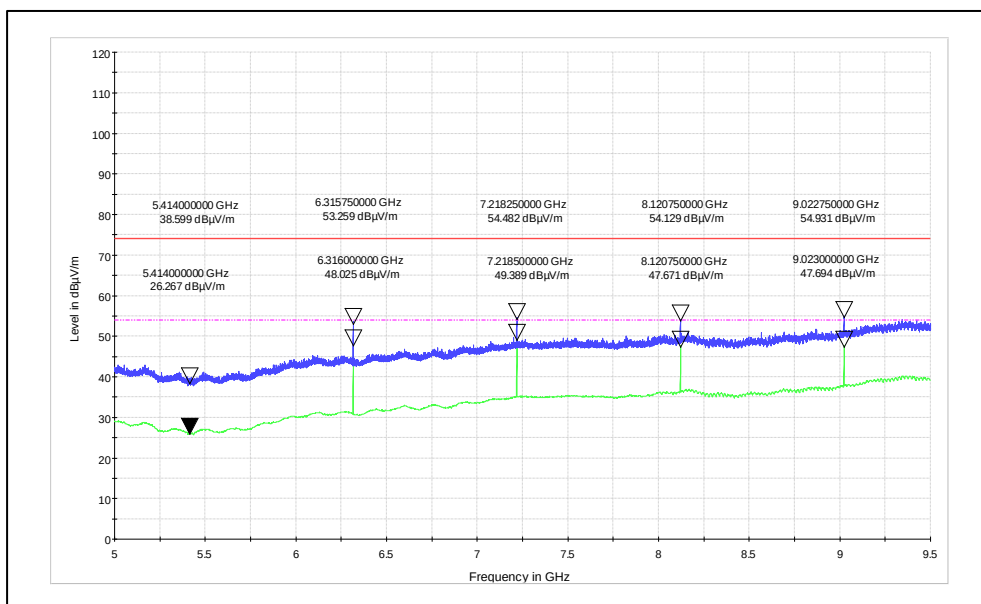
Pk: Peak Detector;
Av: Average Detector

Channel Frequency 902.3MHz



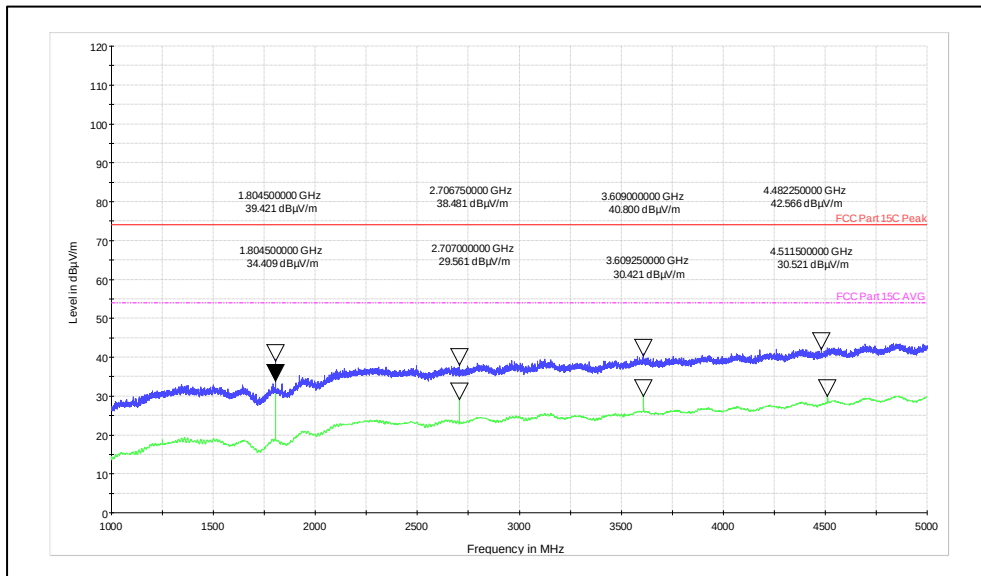
Channel Frequency: 1GHz – 5GHz

Polarization: Vertical



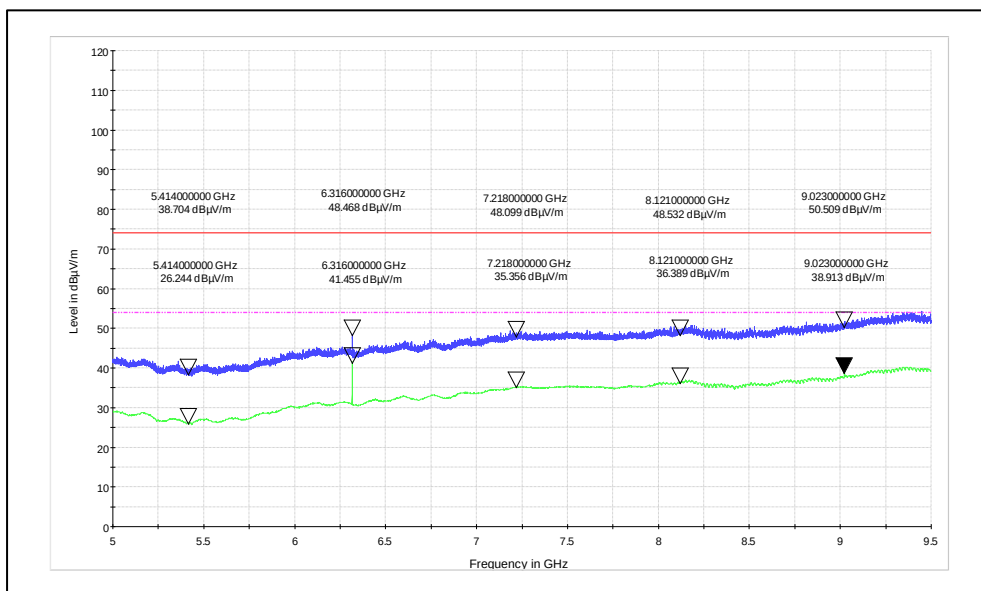
Channel Frequency: 5GHz -10GHz

Polarization: Vertical



Channel Frequency: 1GHz – 5GHz

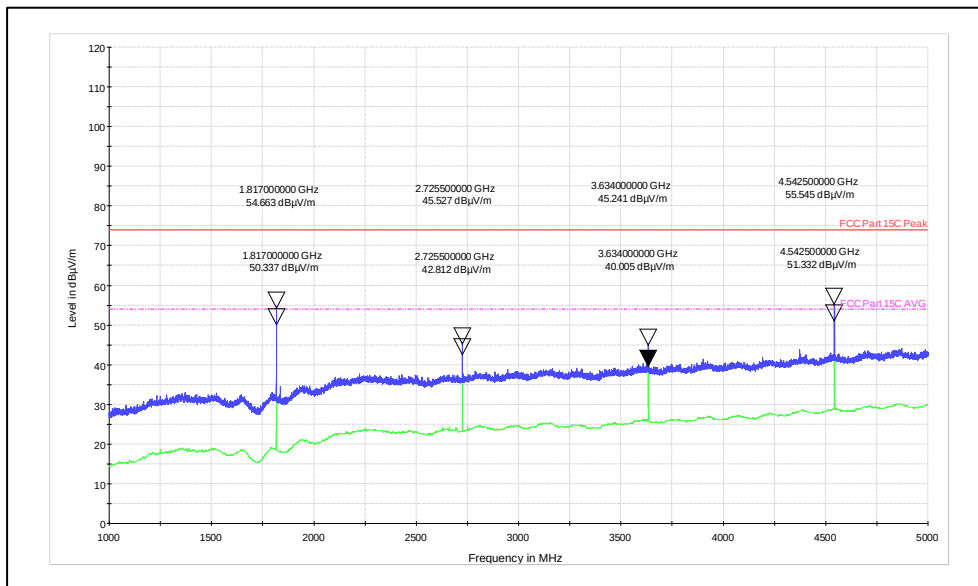
Polarization: Horizontal



Channel Frequency: 5GHz -10GHz

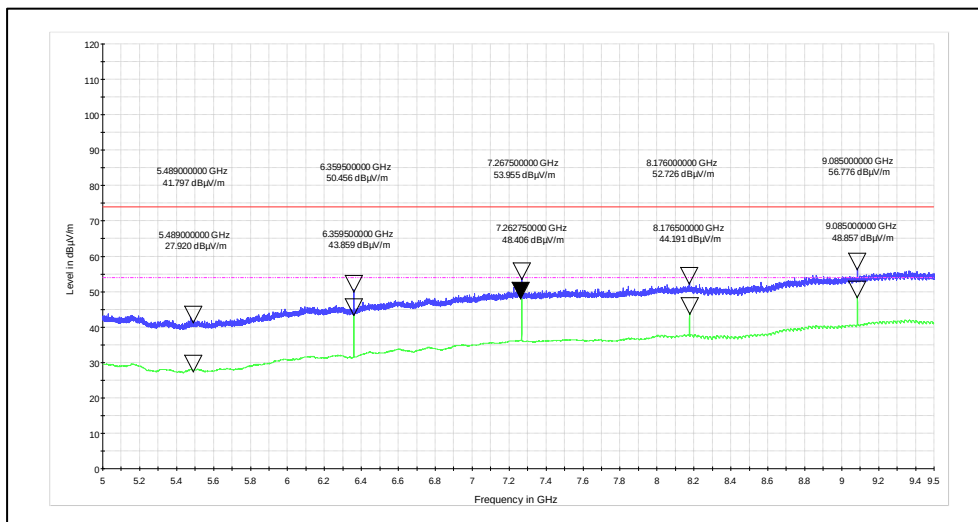
Polarization: Horizontal

Channel Frequency 908.5MHz



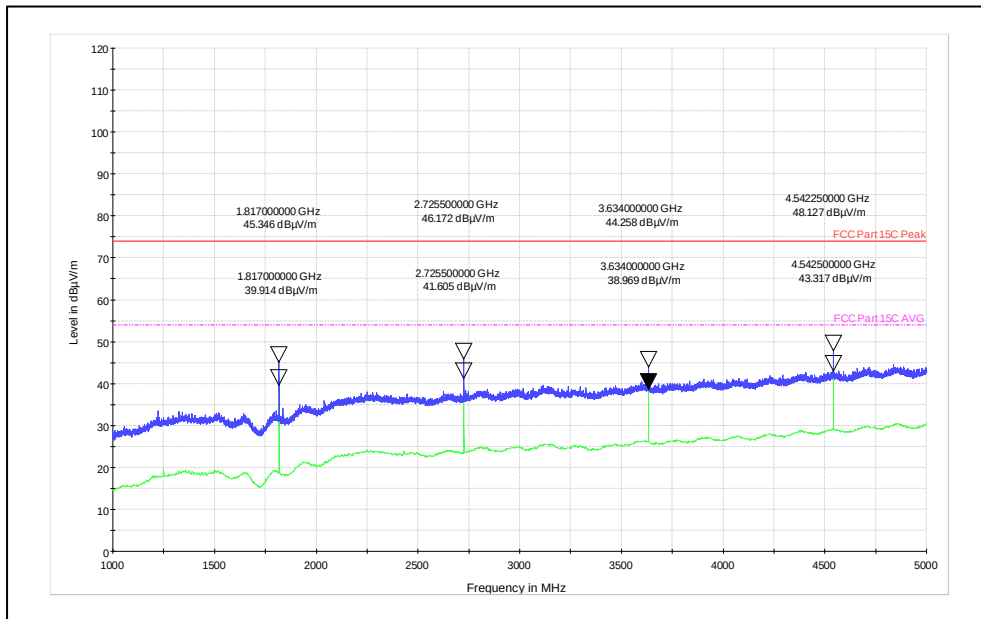
Channel Frequency: 1GHz -5GHz

Polarization: vertical



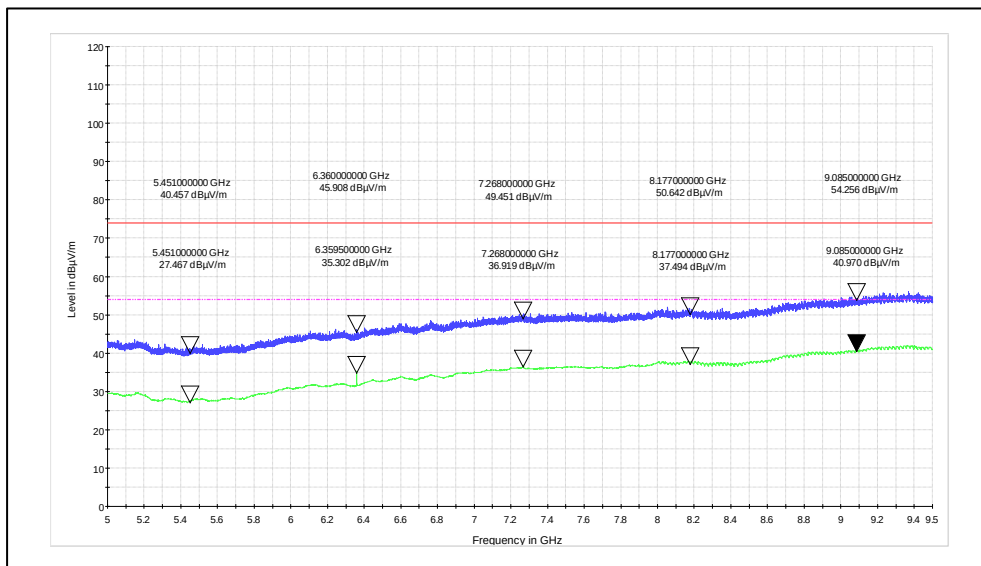
Channel Frequency: 5GHz -10GHz

Polarization: vertical



Channel Frequency: 1GHz -5GHz

Polarization: Horizontal



Channel Frequency: 5GHz -10GHz

Polarization: Horizontal

Prüfbericht - Nr.:
Test Report No.:

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7.8 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 10: 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) = +24 °C Voltage = 110V AC (Through AC to DC Adapter) Relative humidity: 64%

Prüfbericht - Nr.:

Test Report No.:

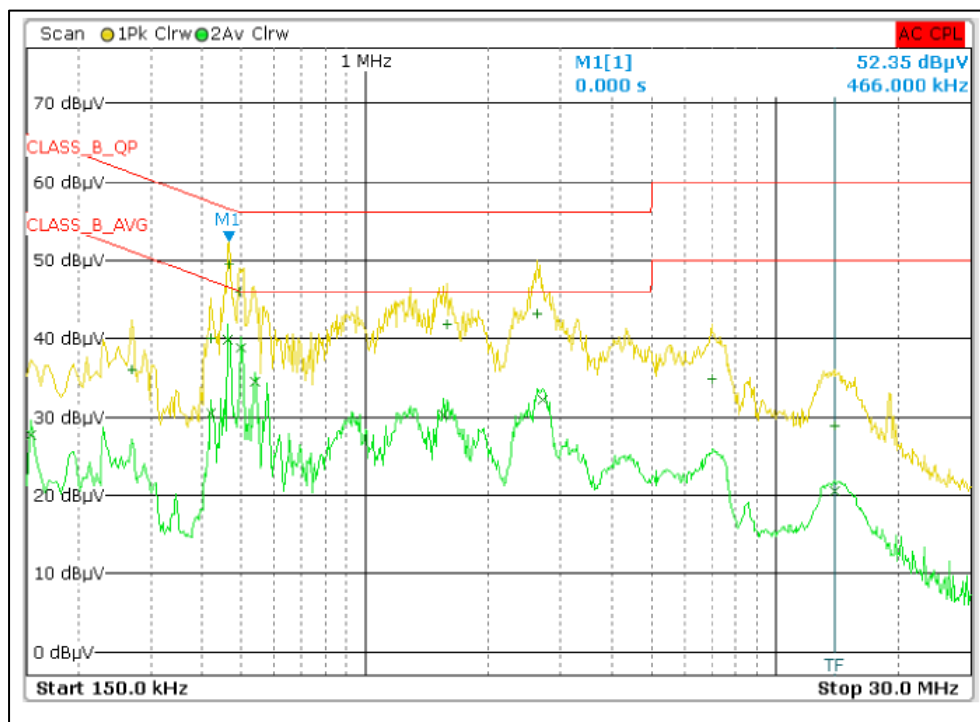
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Test results:

110VAC-60Hz-Line



Trace	Frequency	Level (dBµV)	Phase	Detector	Delta Limit/dB
2	462.000000000 kHz	39.96		Average	-6.70
2	498.000000000 kHz	38.91		Average	-7.12
1	466.000000000 kHz	49.41		Quasi Peak	-7.17
1	494.000000000 kHz	45.94		Quasi Peak	-10.16
2	538.000000000 kHz	34.45		Average	-11.55
1	2.630000000 MHz	43.23		Quasi Peak	-12.77
2	2.710000000 MHz	32.21		Average	-13.79
1	1.586000000 MHz	41.82		Quasi Peak	-14.18
2	1.546000000 MHz	30.30		Average	-15.70
2	422.000000000 kHz	30.55		Average	-16.86
1	422.000000000 kHz	40.07		Quasi Peak	-17.34
1	270.000000000 kHz	36.10		Quasi Peak	-25.02
1	6.986000000 MHz	34.84		Quasi Peak	-25.16
2	154.000000000 kHz	27.66		Average	-28.12
2	13.962000000 MHz	20.46		Average	-29.54
1	13.926000000 MHz	28.92		Quasi Peak	-31.08

Prüfbericht - Nr.:

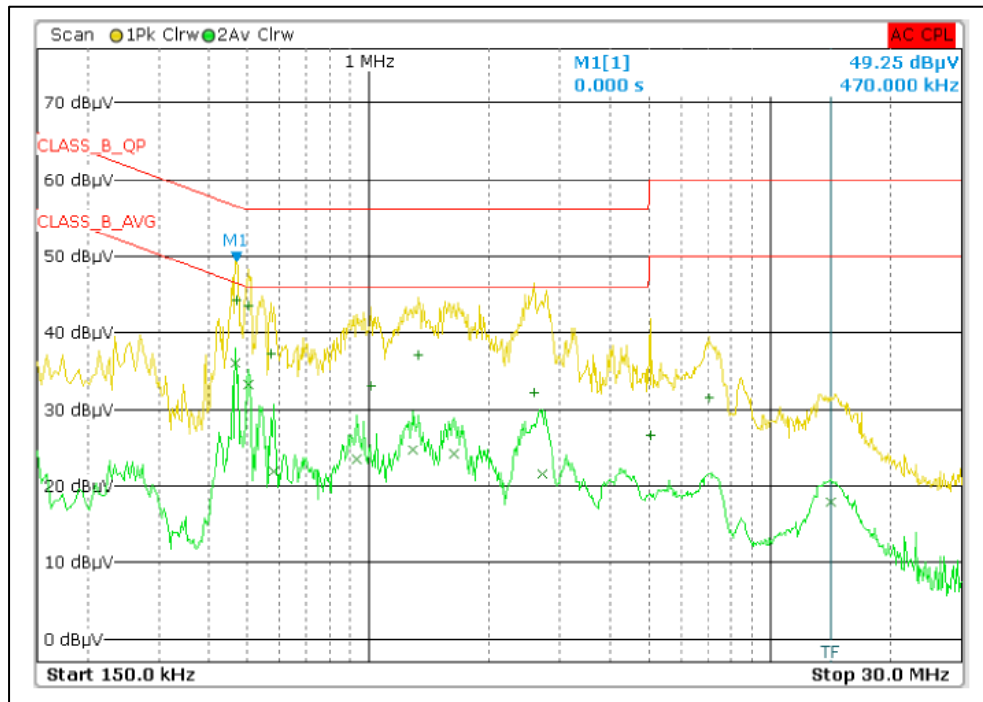
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110VAC-60Hz-Neutral:



Trace	Frequency	Level (dBμV)	Phase	Detector	Delta Limit/dB
2	466.00000000 kHz	36.01		Average	-10.57
1	470.00000000 kHz	44.25		Quasi Peak	-12.26
1	502.00000000 kHz	43.51		Quasi Peak	-12.49
2	502.00000000 kHz	33.29		Average	-12.71
1	574.00000000 kHz	37.25		Quasi Peak	-18.75
1	1.330000000 MHz	37.02		Quasi Peak	-18.98
2	1.294000000 MHz	24.74		Average	-21.26
2	1.630000000 MHz	24.24		Average	-21.76
2	934.00000000 kHz	23.56		Average	-22.44
1	1.018000000 MHz	33.06		Quasi Peak	-22.94
1	2.582000000 MHz	32.20		Quasi Peak	-23.80
2	582.00000000 kHz	21.85		Average	-24.15
2	2.710000000 MHz	21.49		Average	-24.51
1	7.050000000 MHz	31.53		Quasi Peak	-28.47
2	14.118000000 MHz	17.85		Average	-32.15
1	5.030000000 MHz	26.68		Quasi Peak	-33.32

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*****End of test report*****