

Prüfbericht-Nr.: <i>Test report no.:</i>	ULR-TC568821300000048F	Auftrags-Nr.: <i>Order no.:</i>	166550651 0010	Seite 1 von 45 Page 1 of 45	
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	NA	Auftragsdatum: <i>Order date:</i>	2021-04-13		
Auftraggeber: <i>Client:</i>	MoMAGIC Technologies Pvt Ltd. 252-A, FLAT NO.206, PLOT NO.190-191 NEELKANTH PALACE, Sant Nagar, South Delhi, Delhi 110065				
Prüfgegenstand: <i>Test item:</i>	MMT1211				
Bezeichnung: <i>Identification.:</i>	MMT1211				
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, 15.207				
Wareneingangsdatum: <i>Date of sample receipt:</i>	2021-06-21				
Prüfmuster-Nr & Serien-Nr.: <i>Test sample no & serial no.:</i>	A003087479-001 4d4d54010000				
Prüfzeitraum: <i>Testing period:</i>	2021-07-01 - 2021-07-06				
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, Electronic City Phase1 Bangalore -560 100, India FCC Test site registration number: 496599				
Prüfergebnis*: <i>Test result*:</i>	Pass				
geprüft von: <i>tested by:</i>	genehmigt von: <i>authorized by:</i>				
Datum: <i>Date:</i> 2021-07-01	Ausstellatum: <i>Issue date:</i> 2021-09-02				
Stellung / Position:	Likhithesh M D Engineer	Stellung / Position:	Mahammadgouse Kaladagi Assistant Manager		
Sonstiges / Other:	FCC ID: 2A2OT-MMT1211				
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	5 = mangelhaft N/T = nicht
* Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory F(ail) = failed a.m. test specification(s)	4 = sufficient N/A = not applicable	5 = poor N/T = not tested
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>					

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TEST SUMMARY

Test Item	Applicable Standards	Result
	FCC	
Maximum conducted (average) output power	FCC 15.247(b)(3)	Pass
Maximum Power Spectral Density	FCC 15.247(e)	Pass
DTS Bandwidth	FCC 15.247(a)(2)	Pass
Emissions in non-restricted frequency bands	FCC 15.247(d)	Pass
Spurious Radiated Emissions and Restricted Bands of Operation	FCC 15.209 / FCC 15.205	Pass
Conducted Emissions on a.c Power Lines	FCC 15.207	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-TC568821300000048F	01	Initial issue of report	2021-09-02

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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) Pvt.Ltd.,
108 , Beside ISBR Business School,
Electronic city Phase I
Bangalore - 560 100.
India

Radiated Measurement site type :
Fully anechoic chamber (used for above 1 GHz
measurements)

Radiated Measurement site type :
Semi anechoic chamber (used for below 1 GHz
measurements)

2.2 List of Test and Measurement Instruments

Table 1: List of test and measurement instruments

Equipment	Manufacturer	Model Name	Serial Number	Firmware Versions	Calibration Due Date	Periodicity	Test Facility
EMI Receiver	Rohde & Schwarz	ESW 44	101732	4.73 SP5	27.01.2022	Yearly	Radiated Spurious Emission
Active loop antenna	Frankonia	FMZB 1519 B	1519B-00111	-	28.02.2022	Yearly	
Baloon and Biconical Antenna	Schwarzbeck mess-elektronik	VHBB-9124 / BBA-9106	01028	-	03.09.2021	Yearly	
Log - Periodical Antenna	Schwarzbeck mess-elektronik	VUSLP-9111B	9111B-111	-	31.08.2021	Yearly	
Horn Antenna	Schwarzbeck	BBHA 9120 D	9120D-1944	-	11.05.2022	Yearly	
Semi Anechoic Chamber	Frankonia	-	-	-	-	-	
Fully Anechoic Chamber	Albatross	-	-	-	-	-	Antenna-Port Conducted test
Spectrum Analyser	Agilent Technologies	E4407B	US41192 772	A.14.06	10.08.2021	Yearly	
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100811	-	04.08.2021	Yearly	
LISN	Rohde & Schwarz	ENV216	100022	-	04.09.2021	Yearly	Conducted AC Power line Test

Table 2: Instrument application Software versions

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

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3 GENERAL PRODUCT INFORMATION

3.1 Product Function and Intended Use

IOT enabling communication device with 2.4 GHz frequency range over Low Energy Bluetooth (BT5.0) for consumer durables and industrial applications.

3.2 Ratings and System Details of Equipment under Test

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

Radio Protocol		BLE
Operating Frequency Range		2402MHz to 2480MHz
No. of Channels		40 (Reffer Table 5)
Channel Spacing		2MHz
Maximum Measured Power		0.65 dBm
Modulation		GFSK
Number of antennas		1
Antenna Gain		0.5dBi
Antenna Type		Chip antenna, 2450AT18B100E
Supply Voltage to Product		3.3VDC (Range 1.9V to 3.6V)
Environmental conditions	Storage	-40degC to +125°C Relative Humidity <95%
	Operating	-20degC to +85°C Relative Humidity <95%
EUT Dimension		21 x 16.5 x 2.1 mm (L x W x H)

***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 on low, mid and high channels

4.2 UUT Operation and Software

Hardware Version Identification number (HVIN) : MMT1211.1
Software version : MMT1211.1 ver 1.0

4.3 Special Accessories and Auxiliary Equipment

- None

4.4 Countermeasures to achieve EMC Compliance

- None

4.5 List of frequencies

Frequency Band (GHz)	Channel No.	Frequency (MHz)
BLE (2.4-2.4835)	0	2402
	1	2404
	2	2406
	3	2408
	:	:
	:	:
	18	2438
	19	2440
	20	2437
	:	:
	:	:
	36	2474
	37	2476
	38	2478
	39	2480

Table 5: List of BLE Center frequencies

Channel used for BLE testing

Channel low : 2402MHz

Channel mid : 2440MHz

Channel High : 2480MHz

Note:

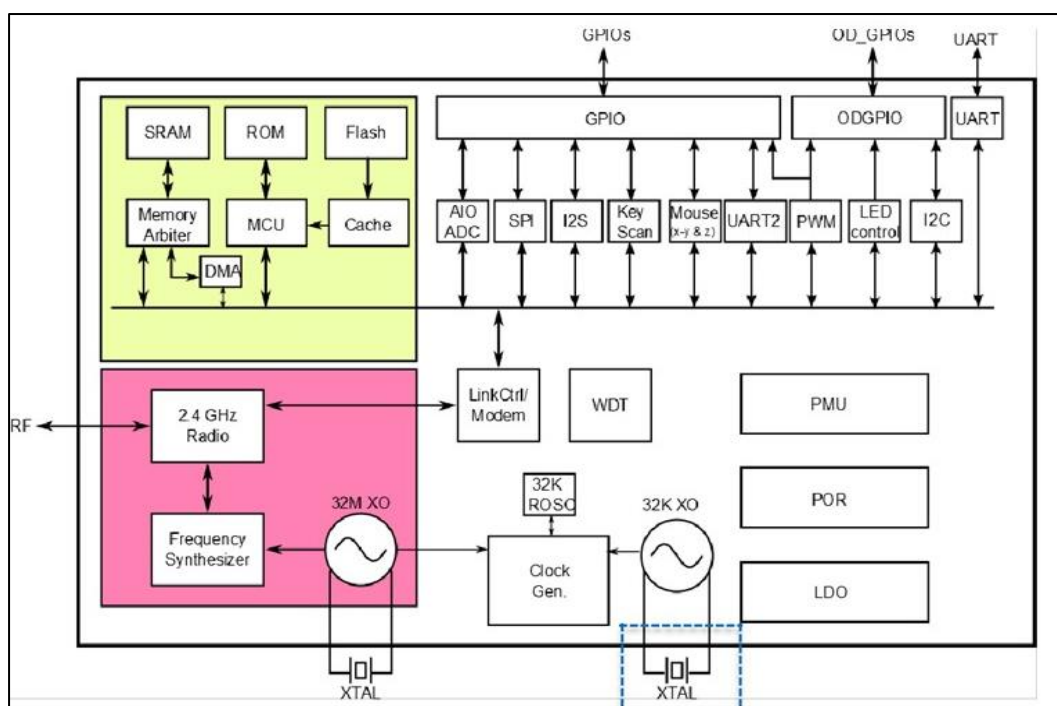
TUV Sample Identification number : A003087479-001– Radiated test Sample
A003087479-001– Conducted test Sample

5 Operational Description

MMT1211 is built on Airoha AB1611 SoC platform, a highly optimized single chip solution integrating baseband, radio and flash memory for game controllers, wearables, mobile payments etc. It supports Bluetooth 5.0 (BLE) specifications, with flexible embedded 512 Kb flash it makes custom software development a breeze

- Operating supply voltage: from 1.7 to 3.6 V
- Operating temperature range: -20 °C to 85 °C
- High performance, ultra-low power Andes 32-bit RISC V architecture core with 16/72 MHz clock rate.
- Programmable 512 kB Flash
- 64 kB SRAM
- 2 x UART interface
- 1 x SPI interface
- 1 x I2C interface
- 3 x 32 bit timer
- Keyscan 16x8
- 5 AIOs for game controller
- 18 GPIOs
- 3 mode I2S
- 12-bit ADC
- Tx power 0/9.5 dBm selectable
- Rx sensitivity -94 dB@1 Mbps/-103 dBm@125Kbps
- Integrated 1.8V switching regulator and 1.8 V LDO.
- Accurate RSSI to allow power control

6 Block Diagram of the product



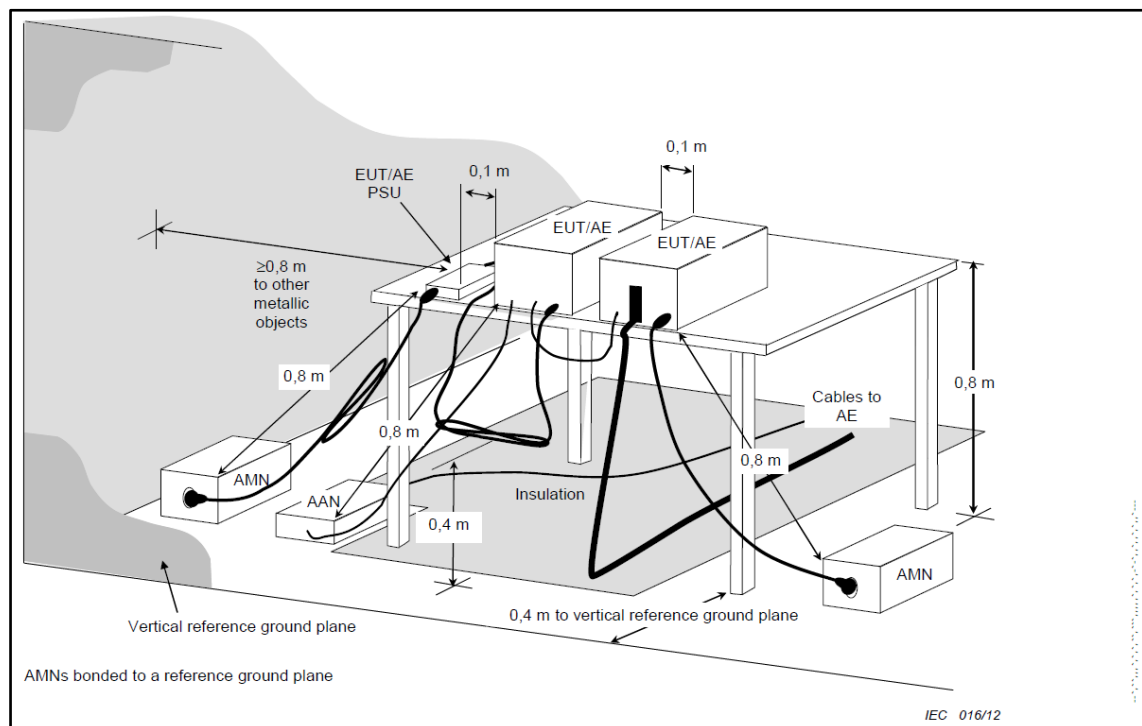
7 TEST METHODOLOGY

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 methods 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

7.2.1 Test Setup Configuration

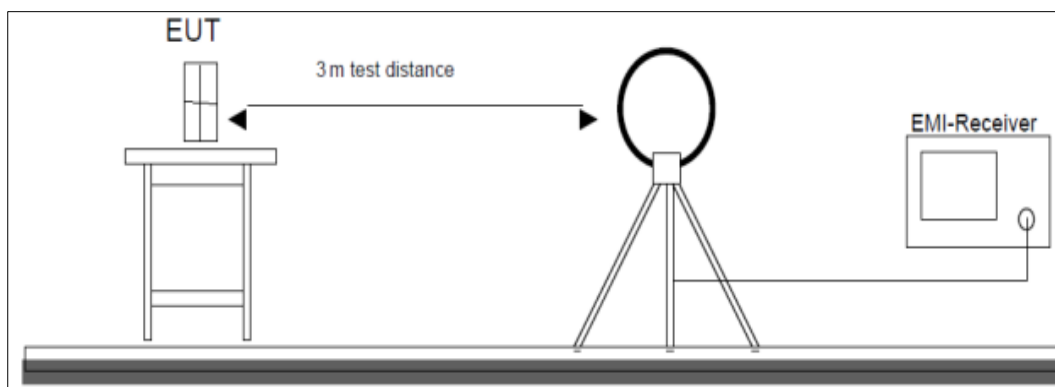


Figure 1: Frequency Range 9 kHz - 30 MHz

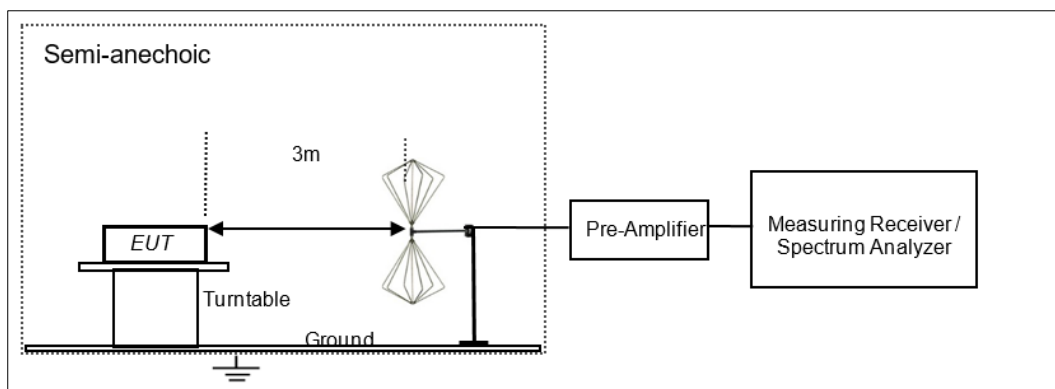


Figure 2: Frequency Range 30 MHz - 200 MHz

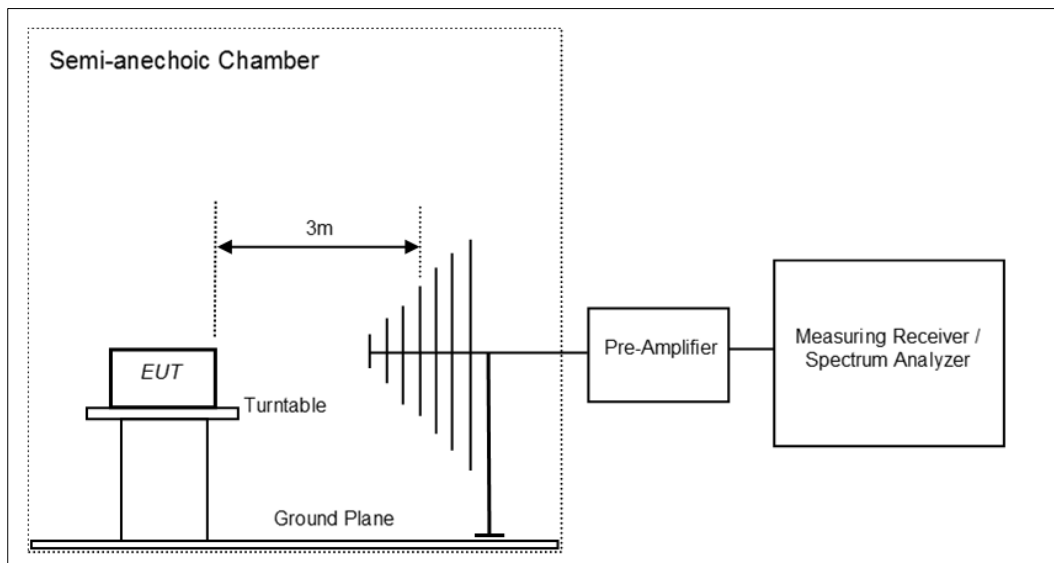


Figure 3: Frequency Range 200 MHz - 1GHz

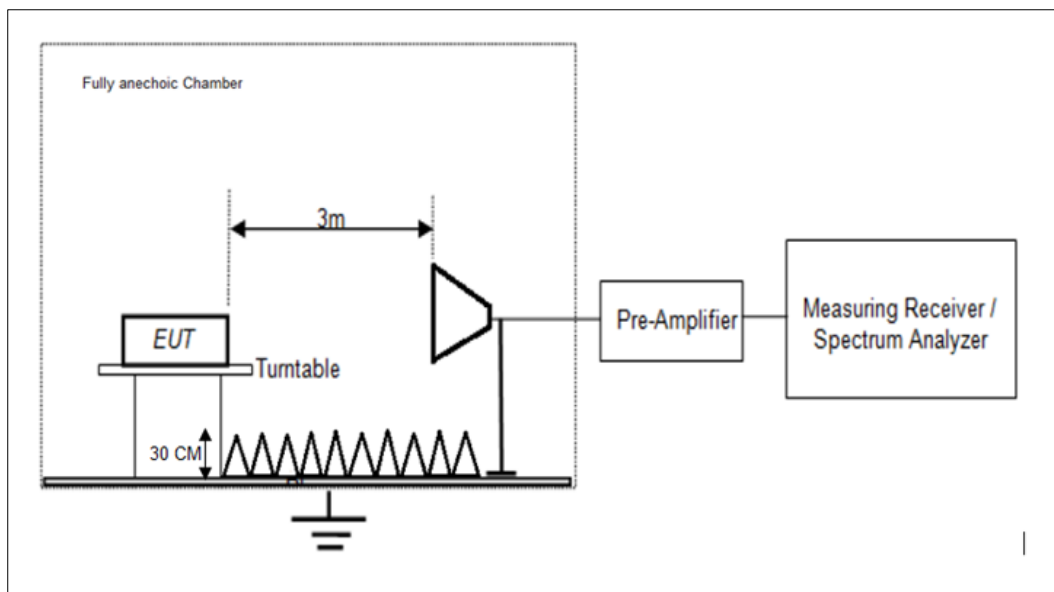


Figure 4: Frequency Range above 1 GHz

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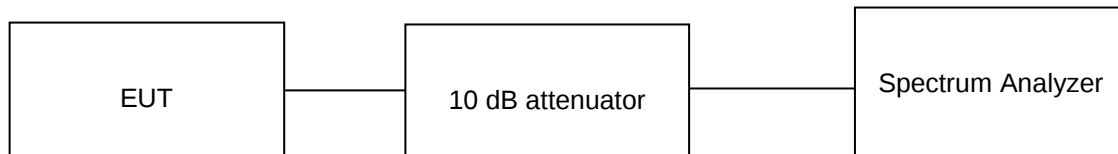
8 TEST RESULTS FOR BLUETOOTH LOW ENERGY

8.1 Maximum Average Conducted Output Power

Result

Pass

Test Specification	FCC part 15 Subpart C 15.247 (b)(3)
Test Method	Subclause 11.9.1.1 of ANSI C63.10
Measurement Bandwidth	300 kHz
Detector	Average detector
Port of testing	Antenna port
Requirement	Power ≤ 1 W (30 dBm) & e.i.r.p ≤ 4 W (36 dBm)



Test Condition

Normal Test Condition:

Temperature (Norm) = + 25 °C Voltage = 3.3V DC Adaptor Relative humidity: 62%

KDB Guidelines applied:

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

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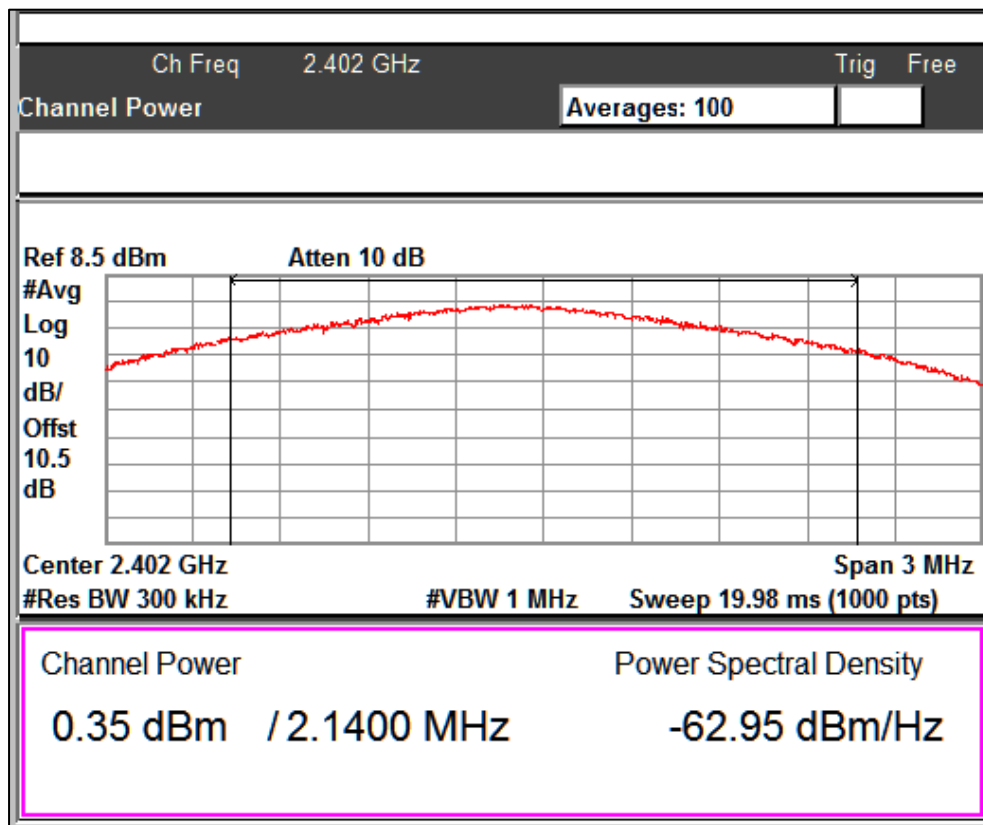
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Test results:

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 (0.5dB)
3. This product do not support additional beamforming gain / directional gain, it uses signal antenna and hence directional gain of the single antenna is 0.5 dBi
4. Maximum (e.i.r.p) = Maximum Peak output power (dBm) + antenna gain (0.5 dBi)

Data Rate (Mbps)	Channel Frequency (MHz)	Maximum Average Conducted Output Power (dBm)	Maximum (e.i.r.p)	Power Limit (dBm)	Limit (e.i.r.p)
2	2402	0.35	0.85	30	36
	2440	0.65	1.15	30	36
	2480	-4.44	-3.94	30	36

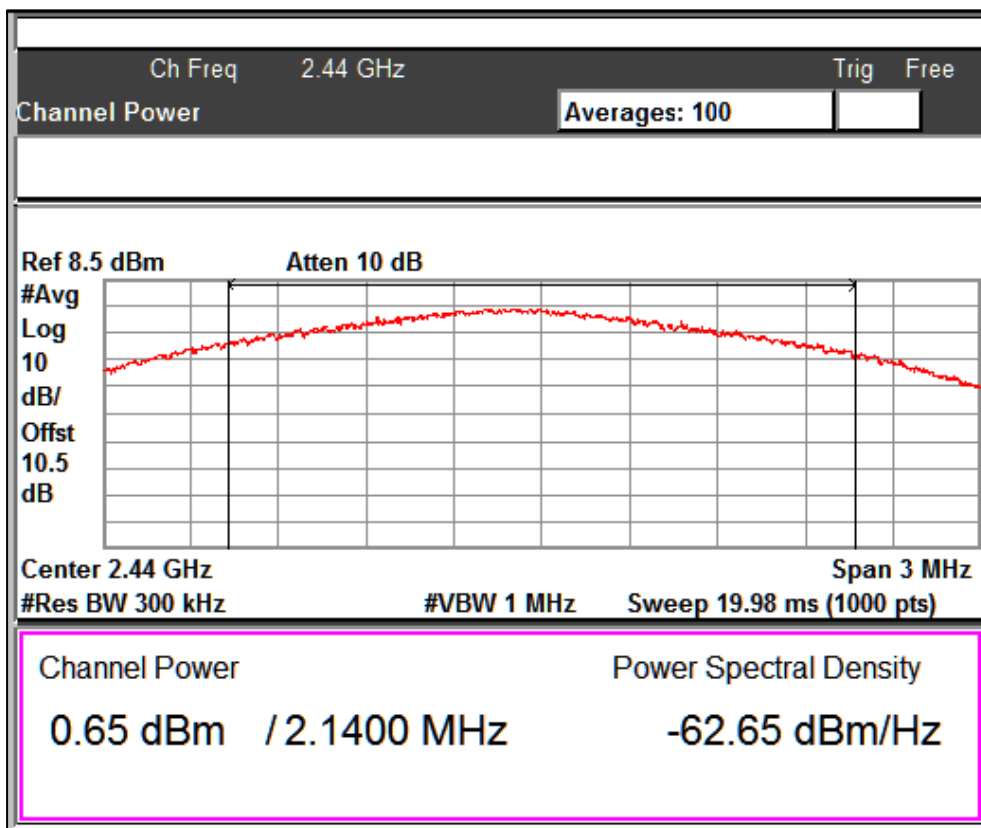


Channel Frequency: 2402MHz

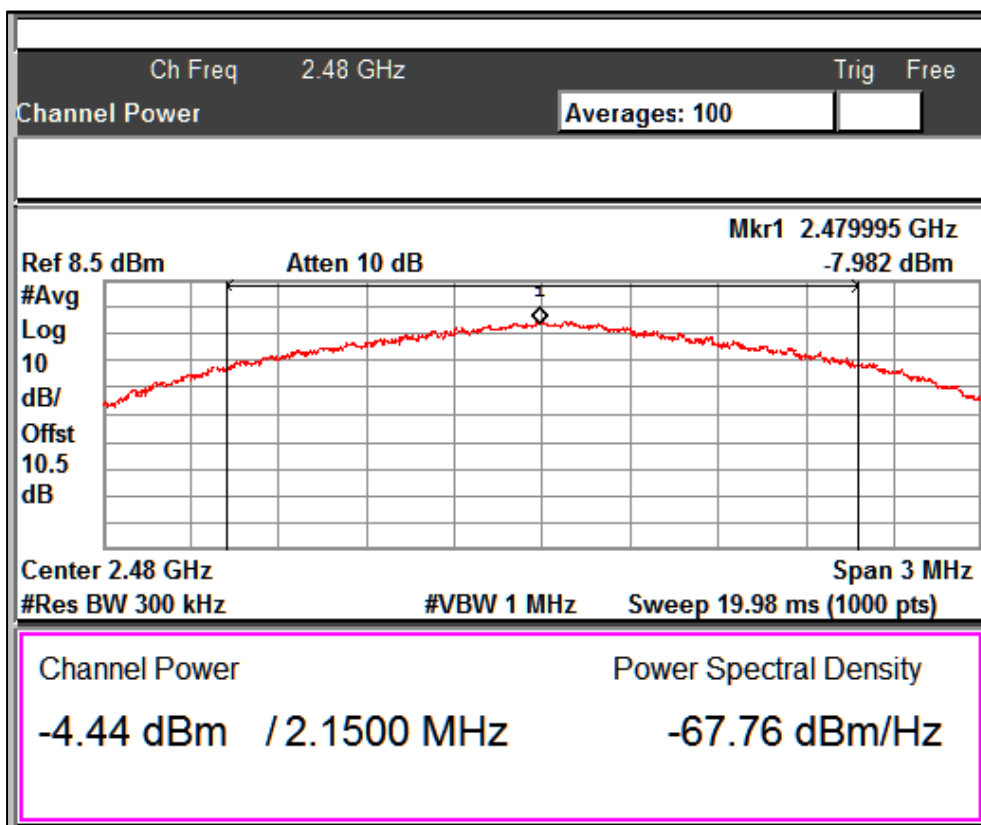
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Channel Frequency: 2440MHz



Channel Frequency: 2480MHz

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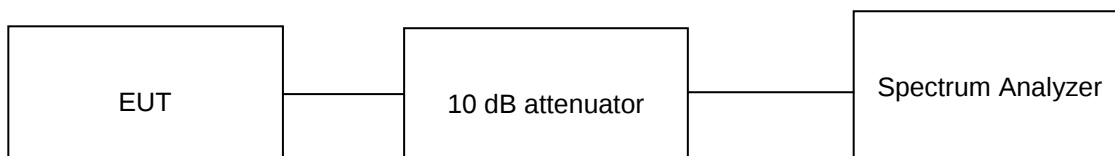
8.2 Maximum Power Spectral Density

Result

Pass

Test Specification	FCC part 15 Subpart C 15.247 (e)
Test Method	Subclause 11.10.2 of ANSI C63.10
Measurement Bandwidth	100 kHz
Detector	Average 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 = 3.3V DC Adaptor

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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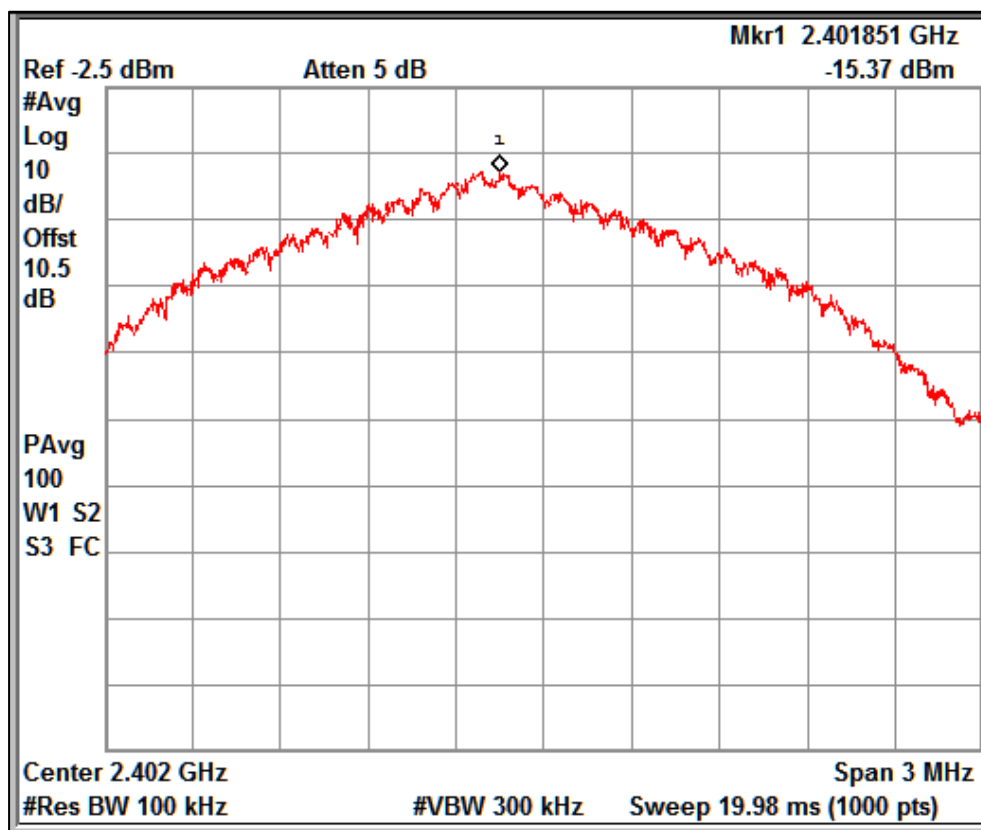
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Test results:

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 signal antenna and hence directional gain of the single antenna is 0.5 dBi

Data Rate (Mbps)	Channel Frequency (MHz)	Maximum Peak PSD (dBm/100kHz)	Limit (dBm/100kHz)
2	2402	-15.37	8
	2440	-15.95	8
	2480	-15.27	8



Channel Frequency: 2402MHz

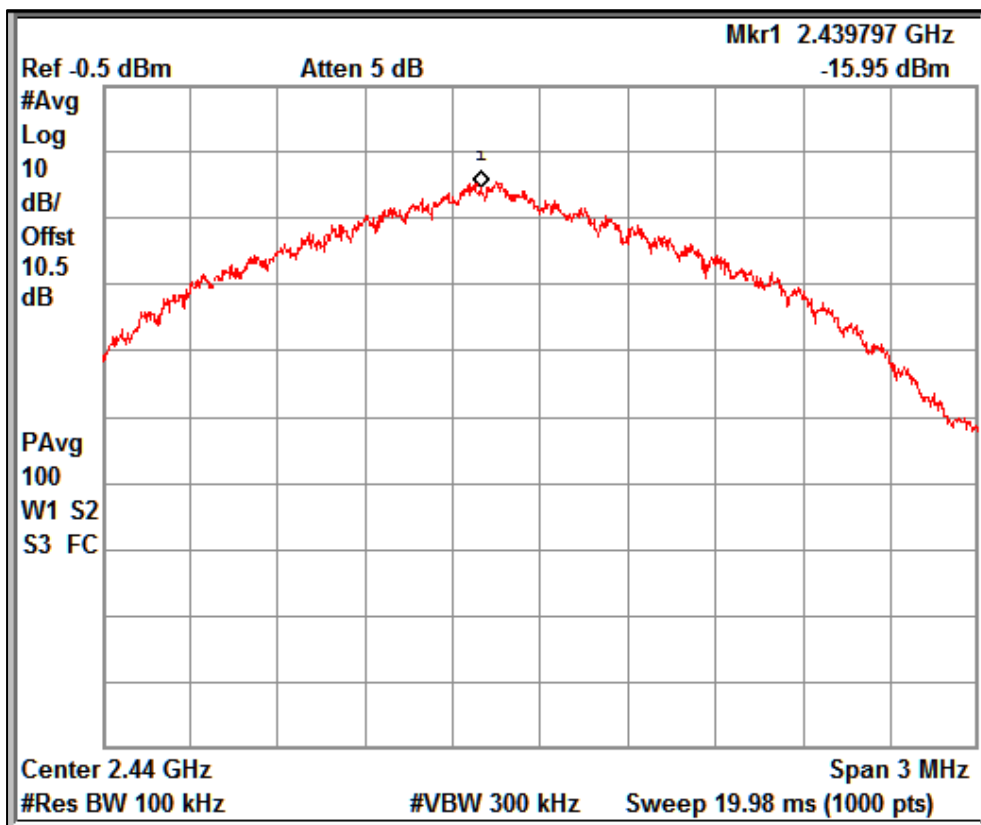
Prüfbericht - Nr.:

Test Report No.:

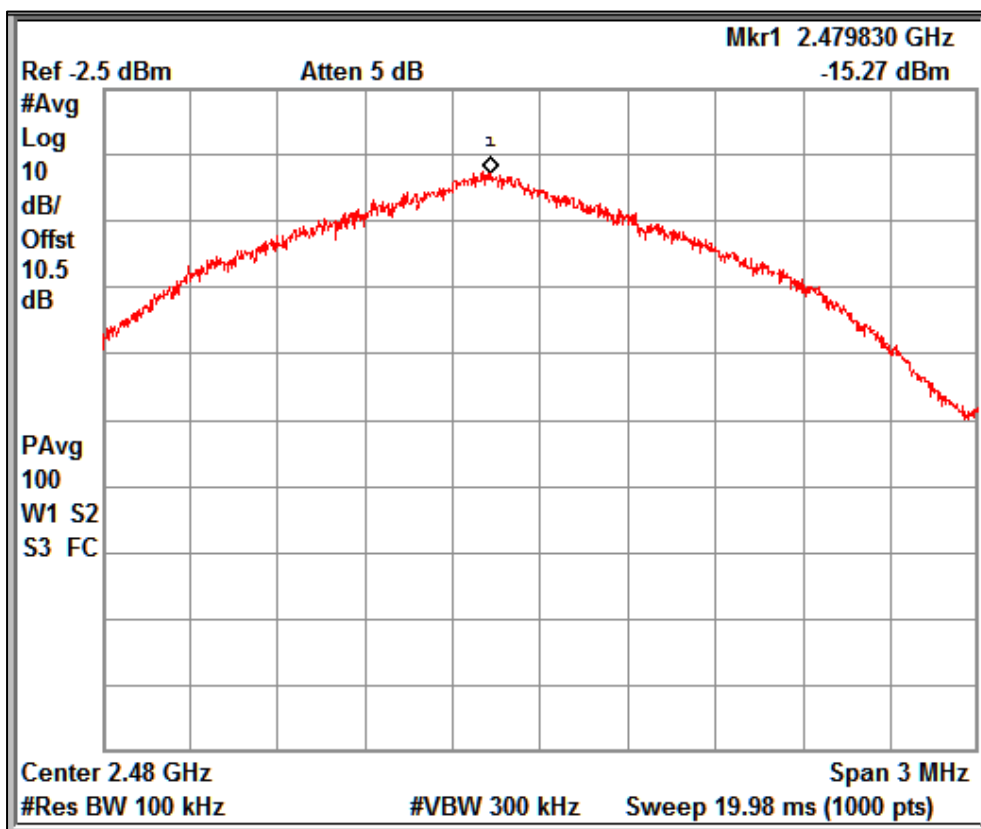
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Channel Frequency: 2440MHz



Channel Frequency: 2480MHz

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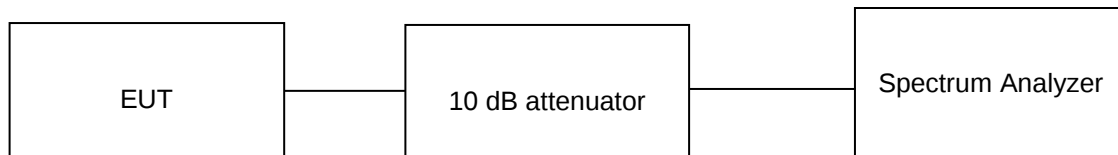
8.3 DTS Bandwidth

Result

Pass

Test Specification	FCC part 15 Subpart C 15.247 (a) (2)
Test Method	Subclause 11.8.1 of ANSI C63.10
Measurement Bandwidth	100 kHz
Detector	Peak detector
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 = 3.3V DC Adaptor 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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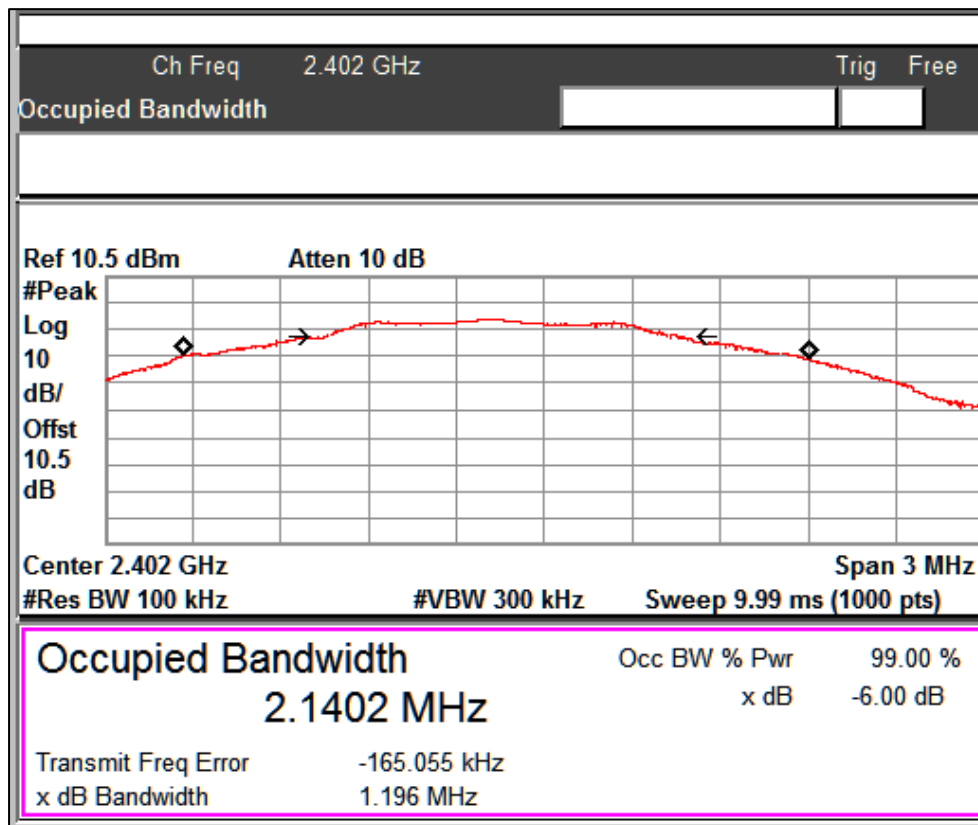
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Test results:

Note:

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

Data Rate (Mbps)	Channel Frequency (MHz)	6 dB Bandwidth (MHz)	99% OBW (MHz)	Minimum Limit (MHz)
2	2402	1.19	2.14	0.5
	2440	1.17	2.14	0.5
	2480	1.16	2.15	0.5

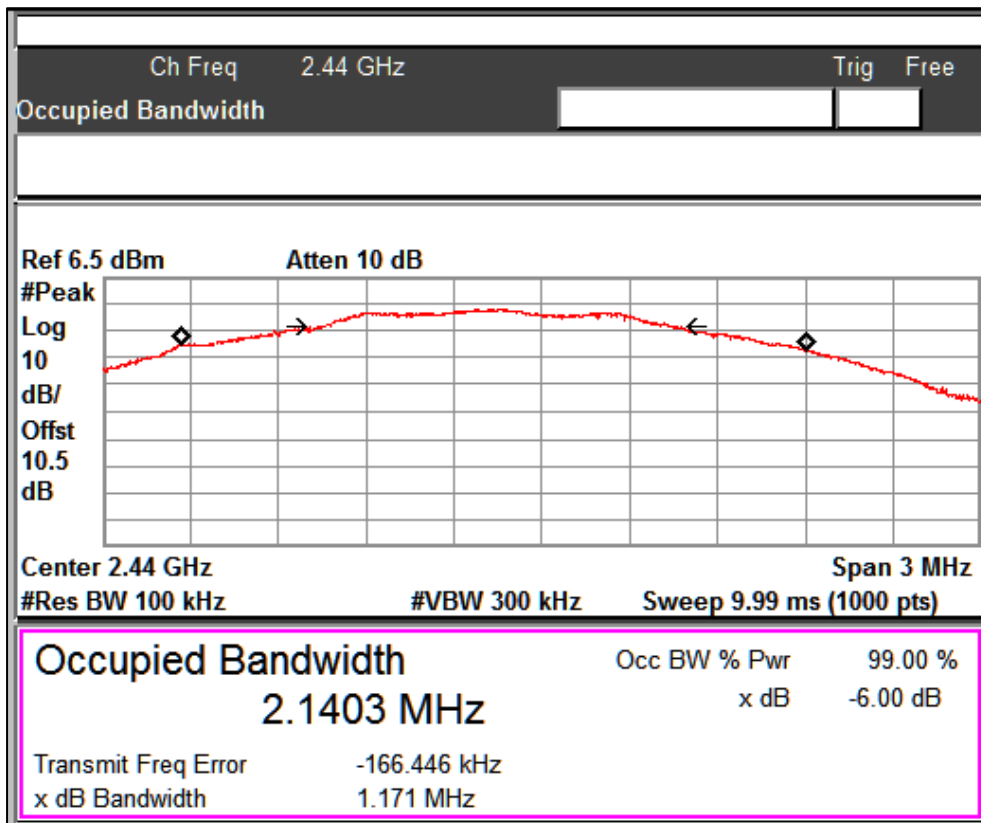


Channel Frequency: 2402MHz

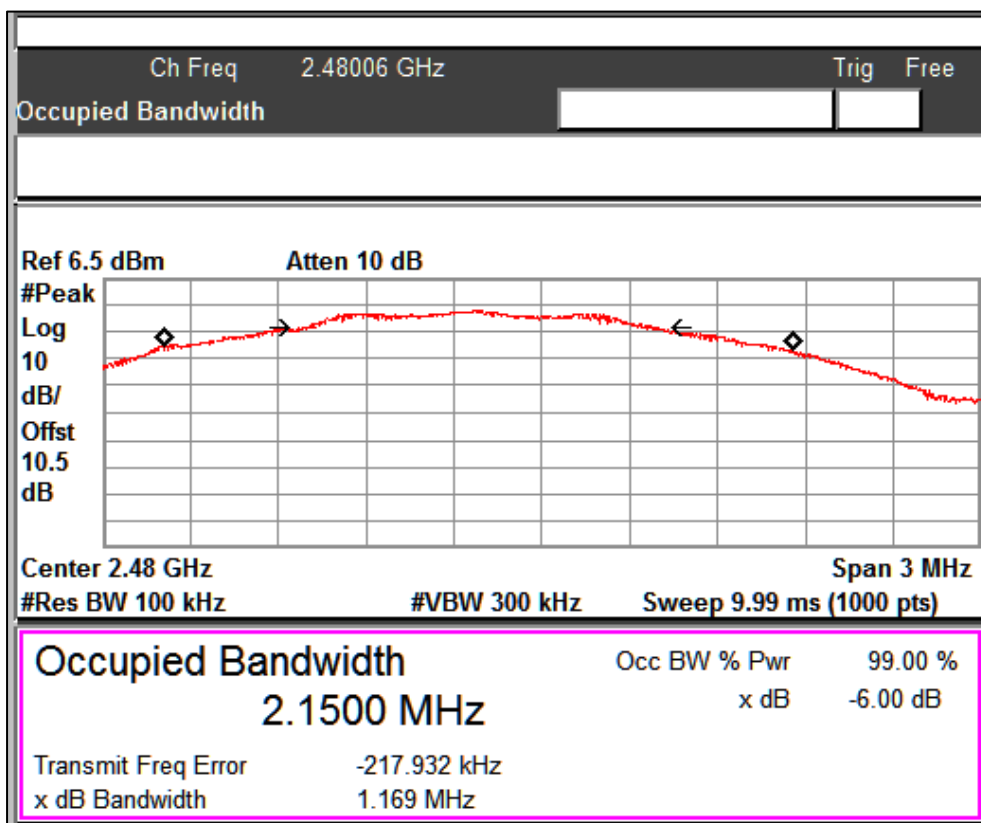
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Channel Frequency: 2440MHz



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)

Test Method

Subclause 11.11 of ANSI C63.10

Measurement Bandwidth

100 kHz

Detector

Peak

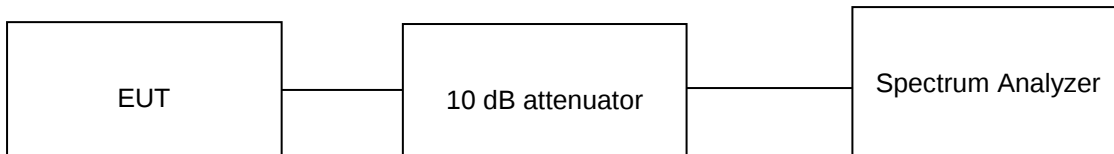
Port of testing

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 average conducted power limits

Test Method:



Test Condition

Normal Test Condition:

Temperature (Norm) = +25 °C

Voltage = 3.3V DC Adaptor

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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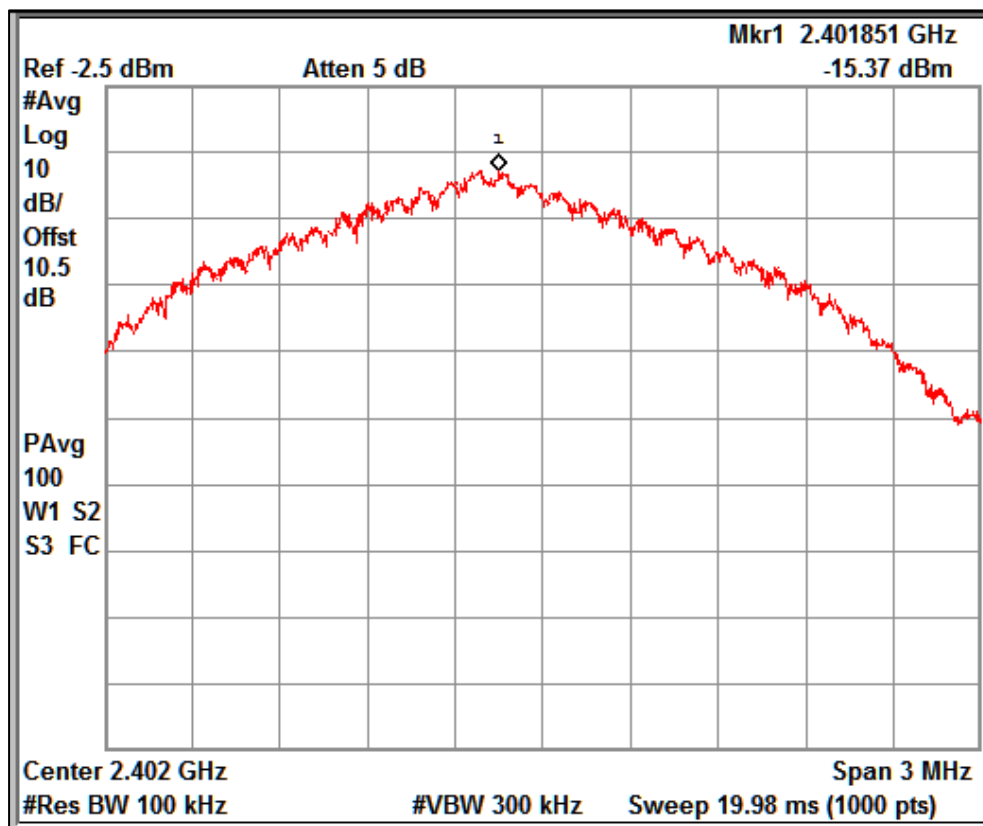
Test results:

Note:

1. All the losses are included during measurement and final values are mentioned in the test report.
2. Final Value (dBm) = Measured Value (dBm) + Attenuator factor (10dB) + Cable loss (0.5dB)
3. This product do not support additional beamforming gain / directional gain, it uses signal antenna and hence directional gain of the single antenna is 0.5 dBi

8.4.1 Band edge and reference plots

Data Rate (Mbps)	Channel Frequency (MHz)	Reference Value (B) (dBm)	Band edge Frequency (MHz)	Value at Band edge (A) (dBm)	A-B (dBc)	Minimum Limit (dBc)
2	2402	-15.37	2390	-64.55	-49.18	-30
	2480	-15.27	2483.5	-63.59	-48.32	-30

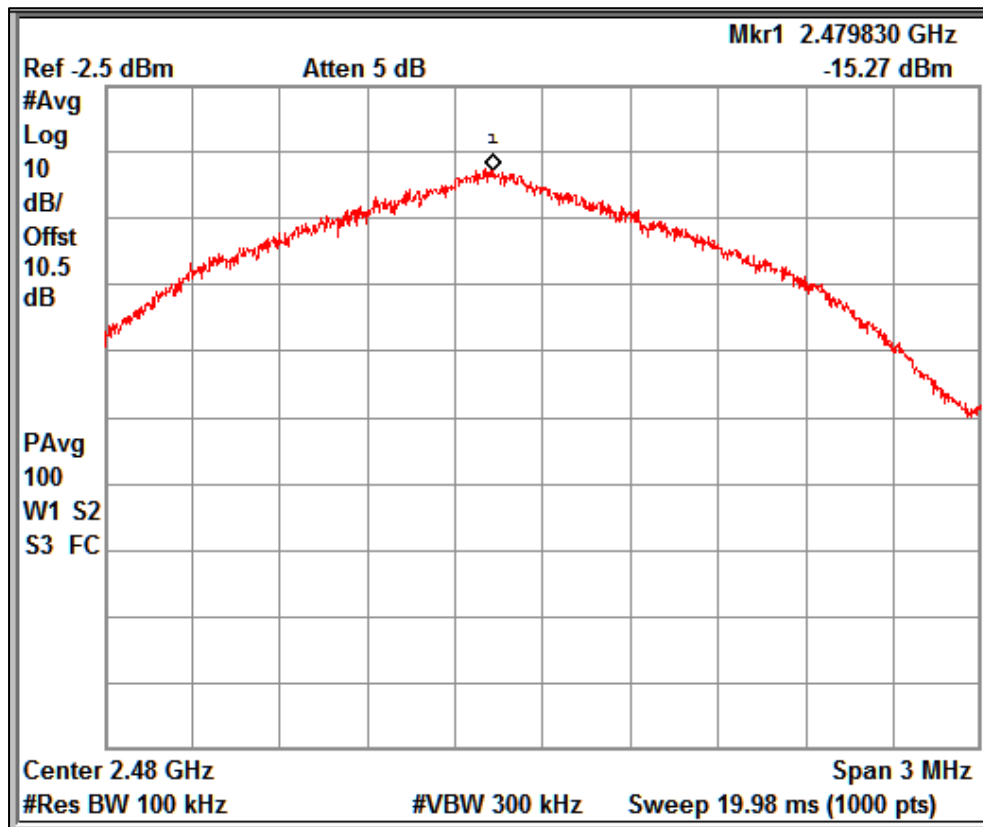


Reference Plot for Channel Frequency 2402MHz

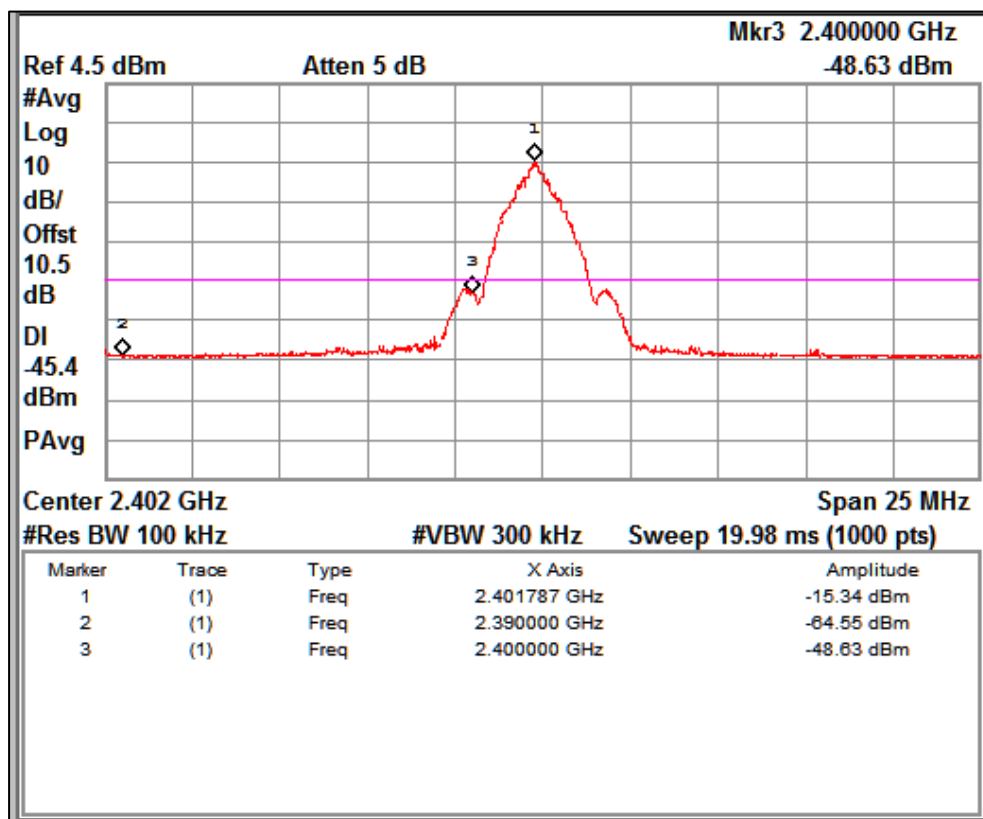
Prüfbericht - Nr.:
Test Report No.:

ULR-TC568821300000048F

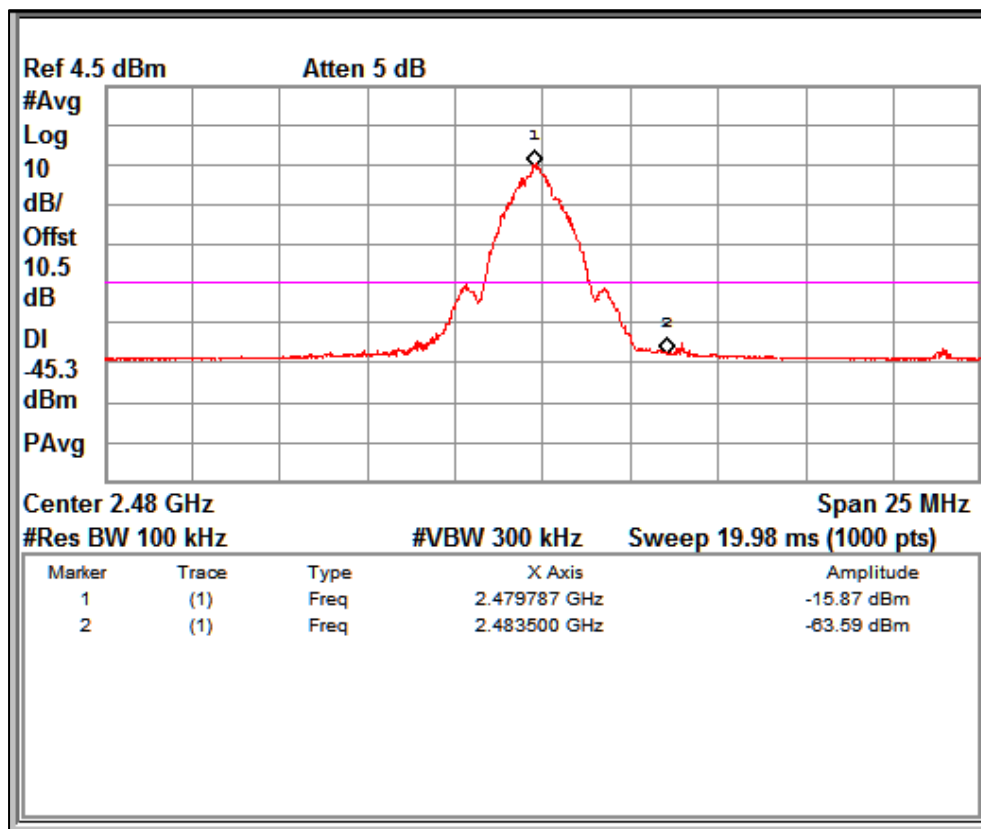
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Reference Plot for Channel Frequency 2480MHz

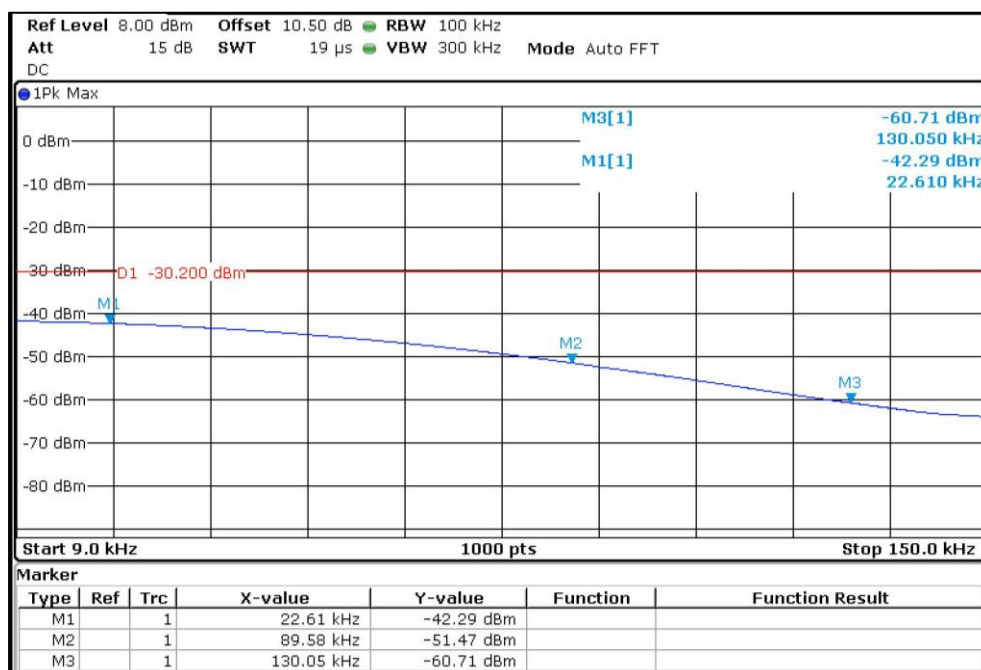


Channel Frequency: 2402MHz



Channel Frequency: 2480MHz

8.4.2 Out-Of-Band Emissions



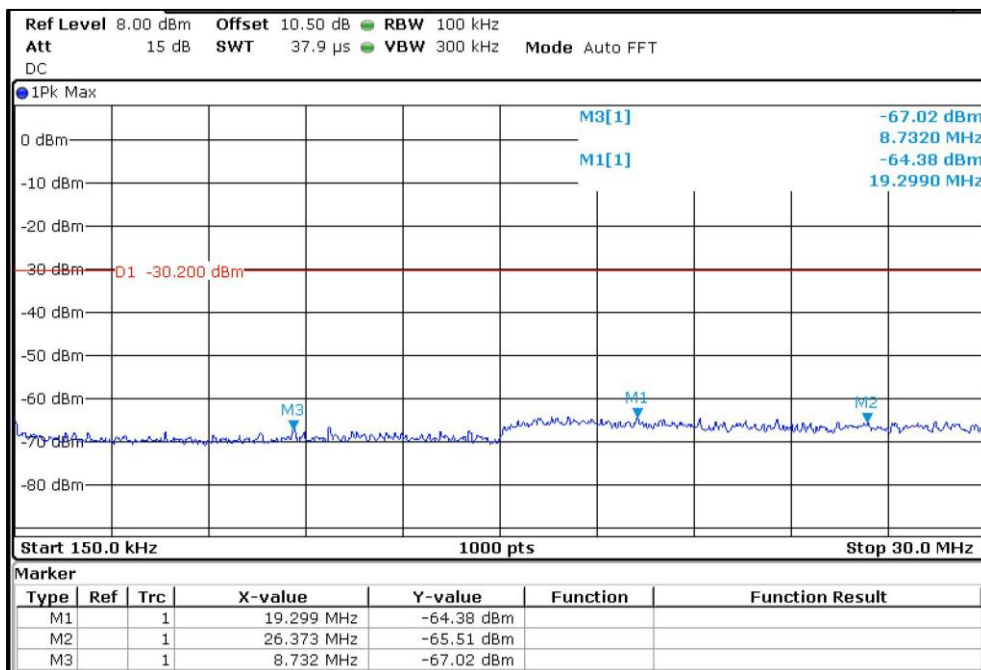
Channel Frequency 2402MHz

Frequency Range 9 kHz – 150 kHz

Prüfbericht - Nr.:
Test Report No.:

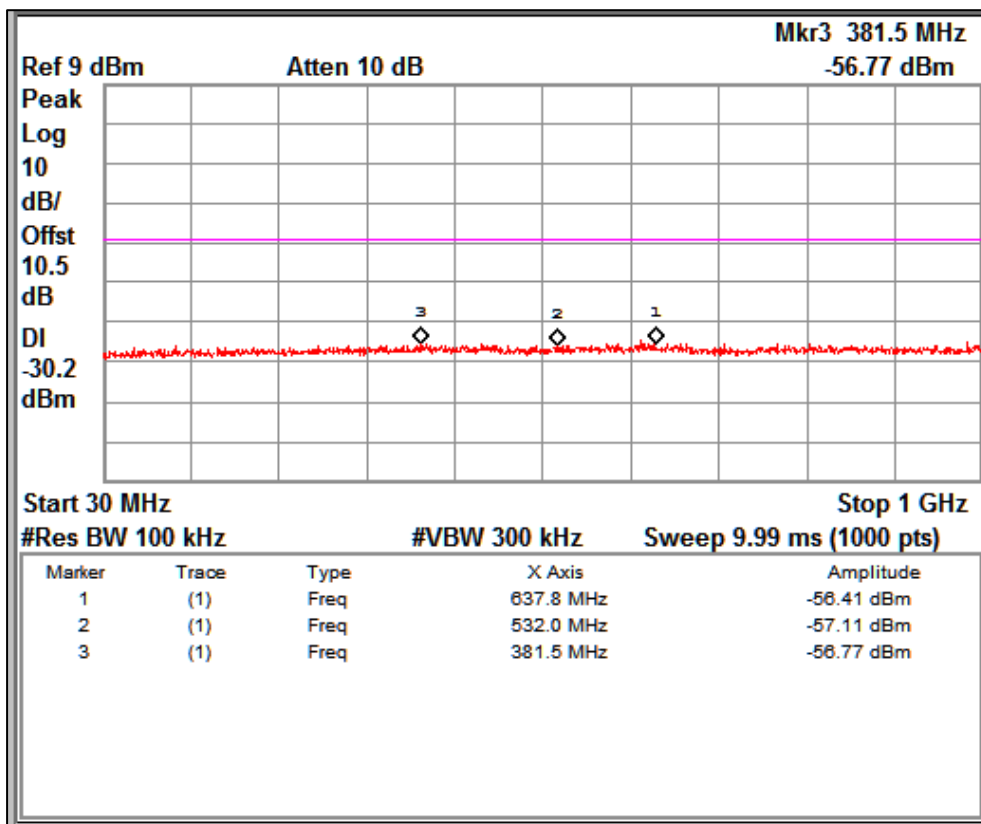
ULR-TC568821300000048F

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Channel Frequency 2402MHz

Frequency Range 150 kHz – 30 MHz



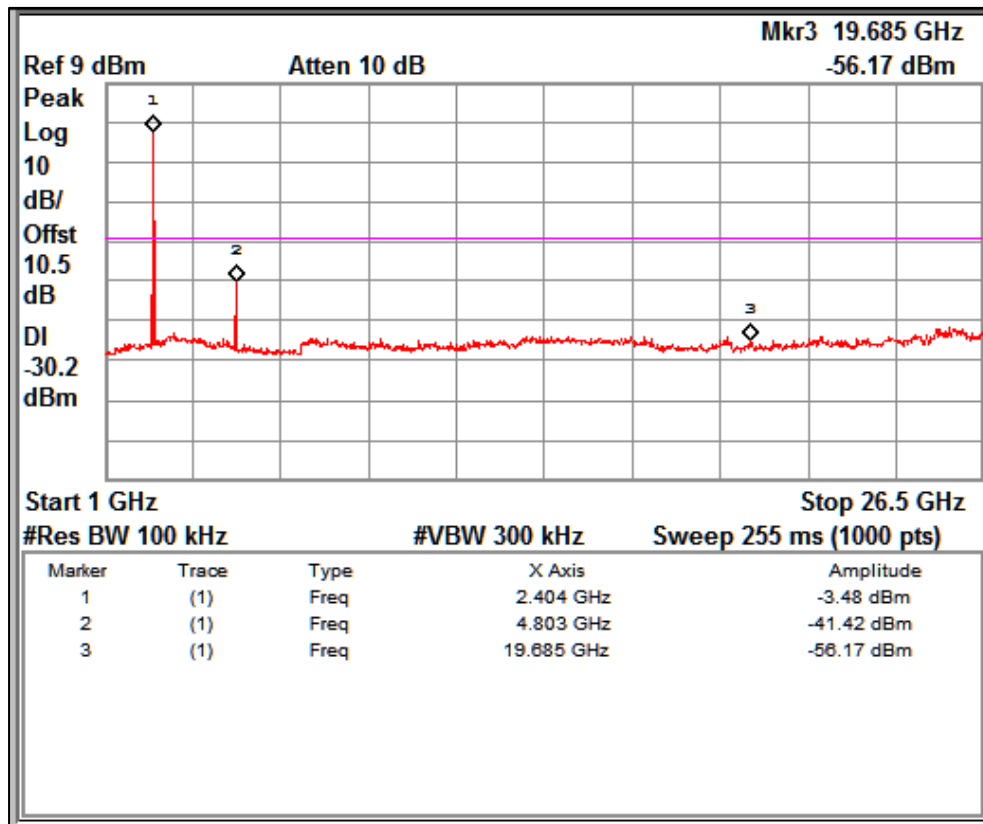
Channel Frequency 2402MHz

Frequency Range 30 MHz – 1GHz

Prüfbericht - Nr.:
Test Report No.:

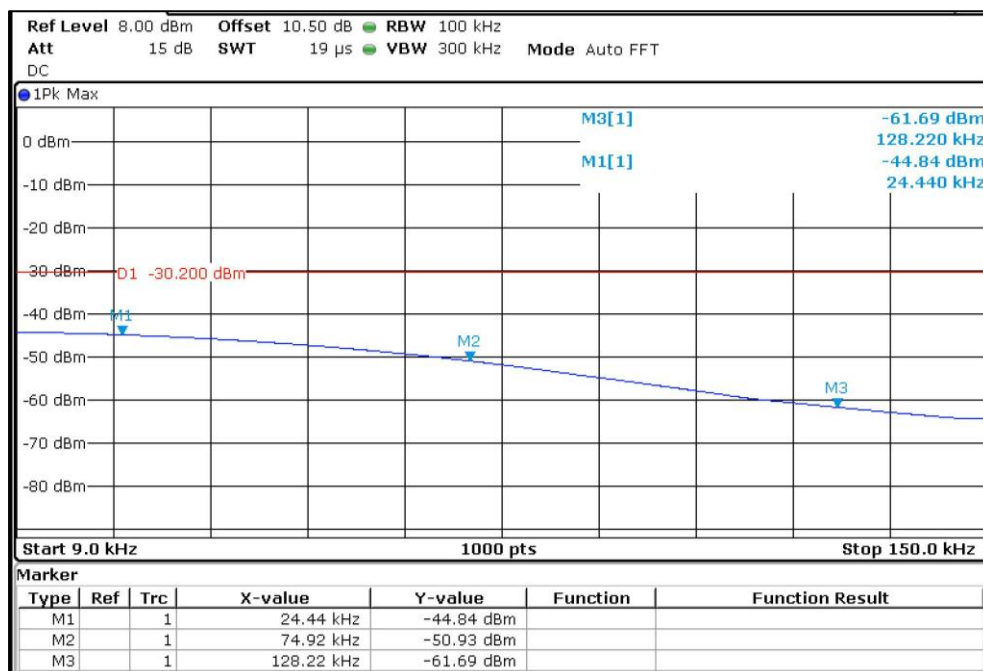
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Channel Frequency 2402MHz

Frequency Range 1 GHz – 26.5GHz



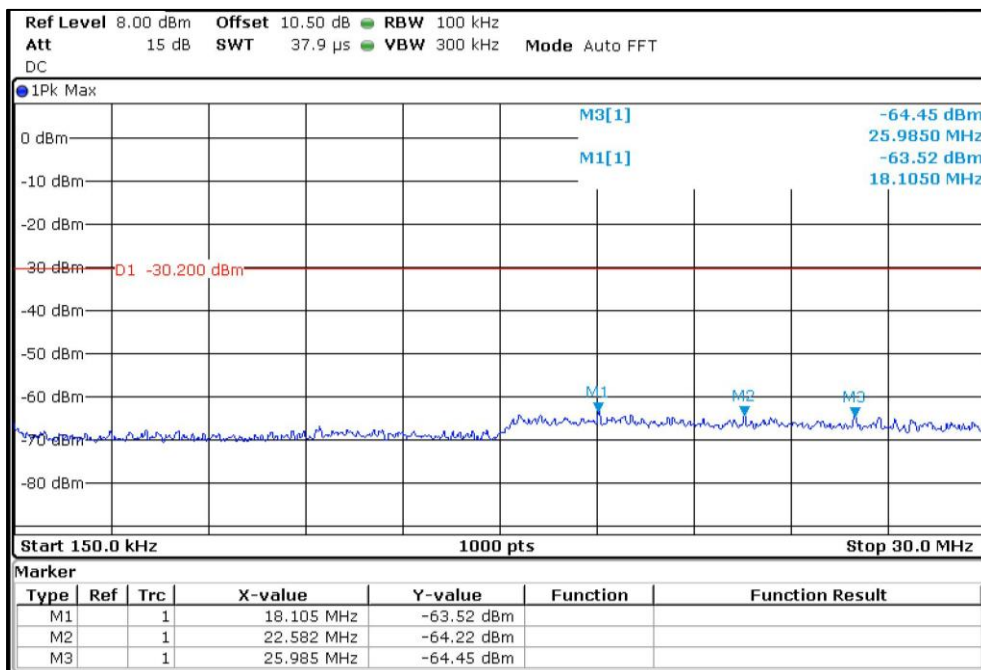
Channel Frequency 2440MHz

Frequency Range 9 kHz – 150 kHz

Prüfbericht - Nr.:
Test Report No.:

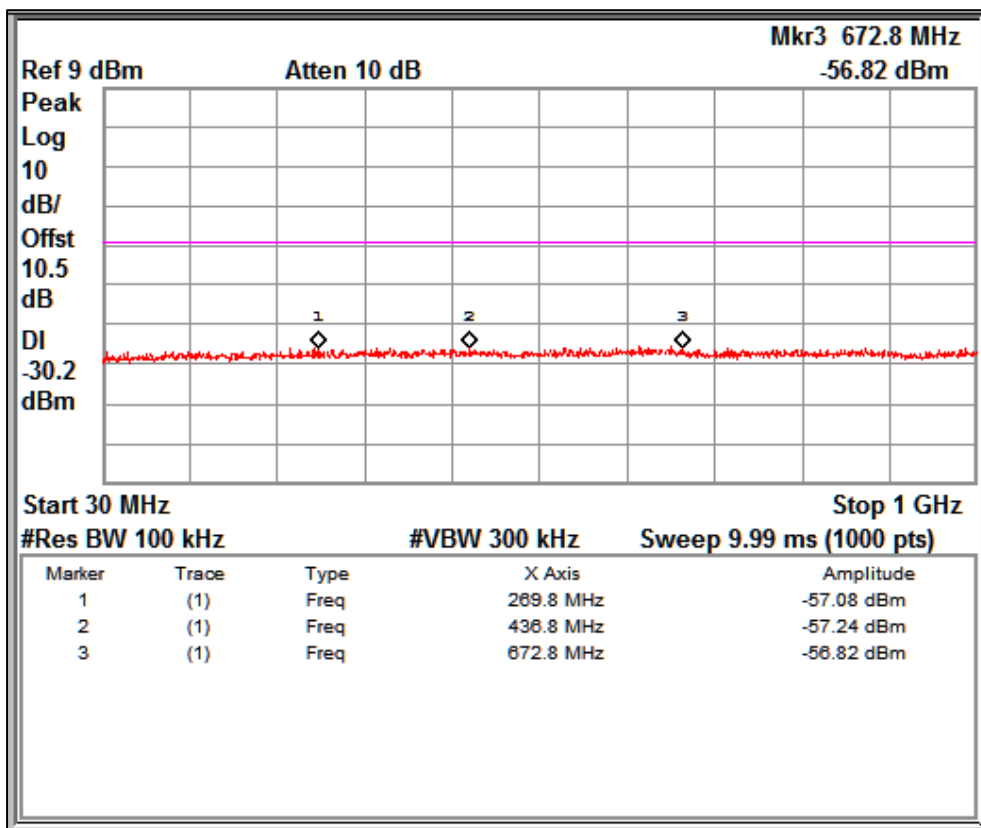
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Channel Frequency 2440MHz

Frequency Range 150 kHz – 30 MHz



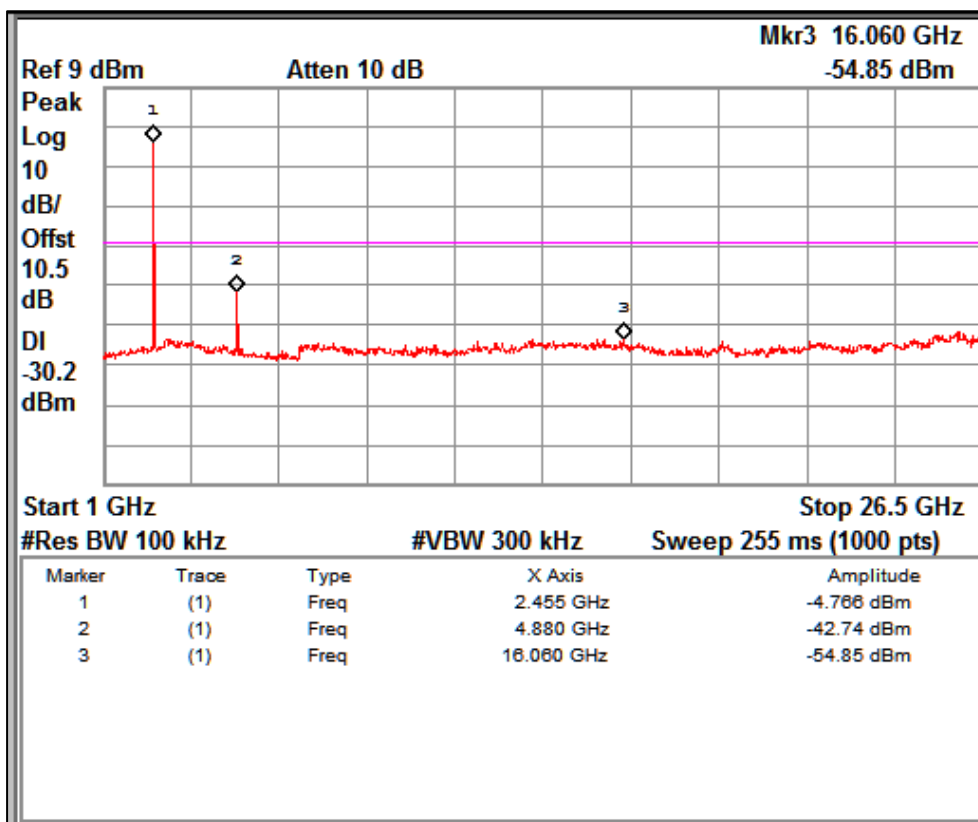
Channel Frequency 2440MHz

Frequency Range 30 MHz – 1GHz

Prüfbericht - Nr.:
Test Report No.:

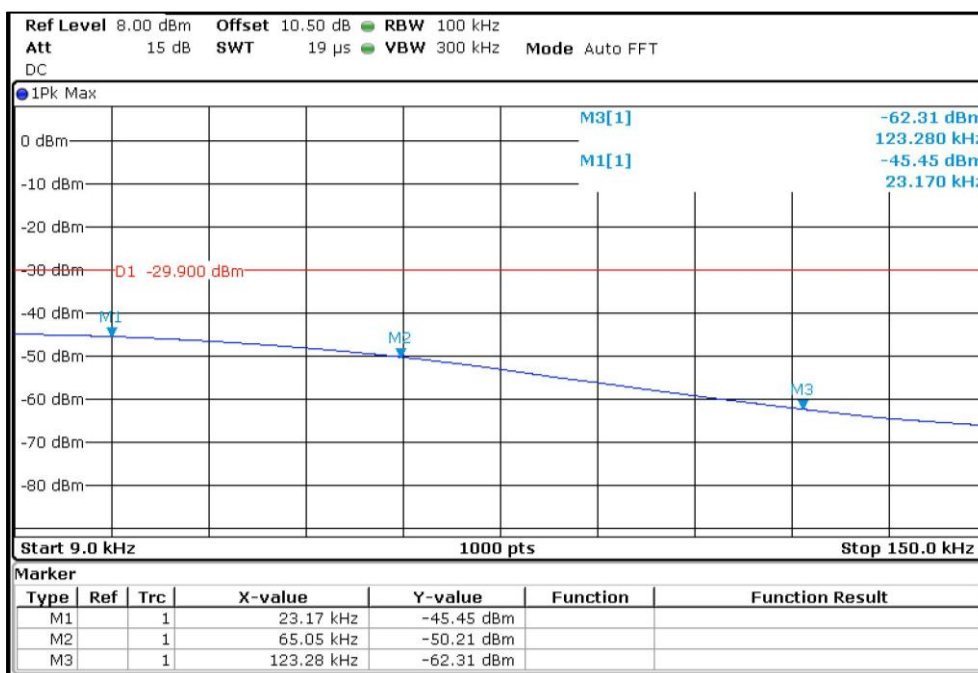
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Channel Frequency 2440MHz

Frequency Range 1 GHz – 26.5GHz



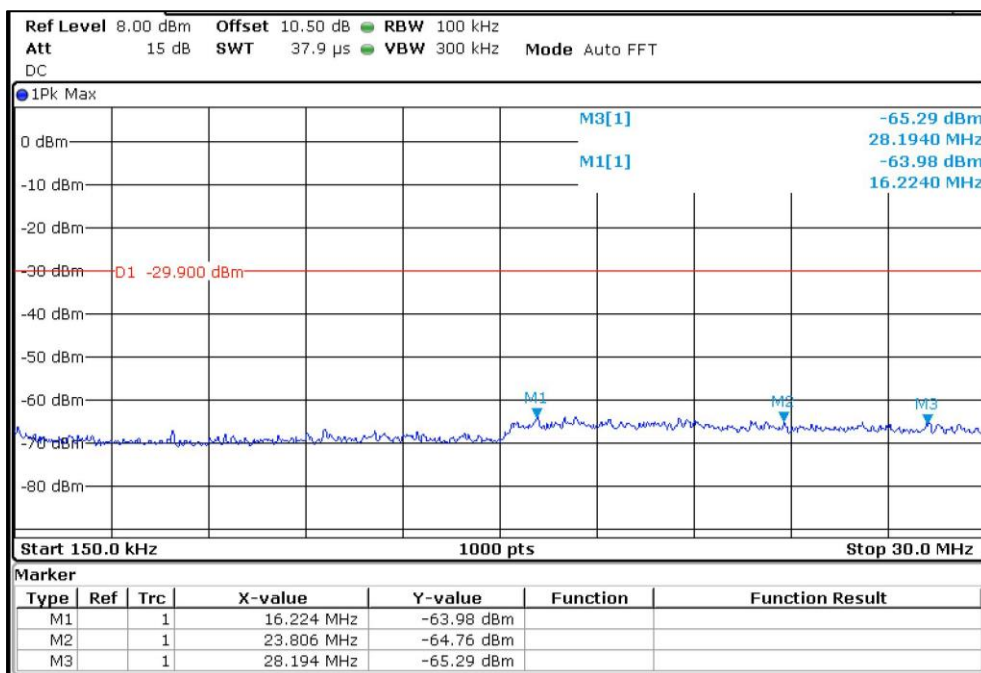
Channel Frequency 2480MHz

Frequency Range 9 kHz – 150 kHz

Prüfbericht - Nr.:
Test Report No.:

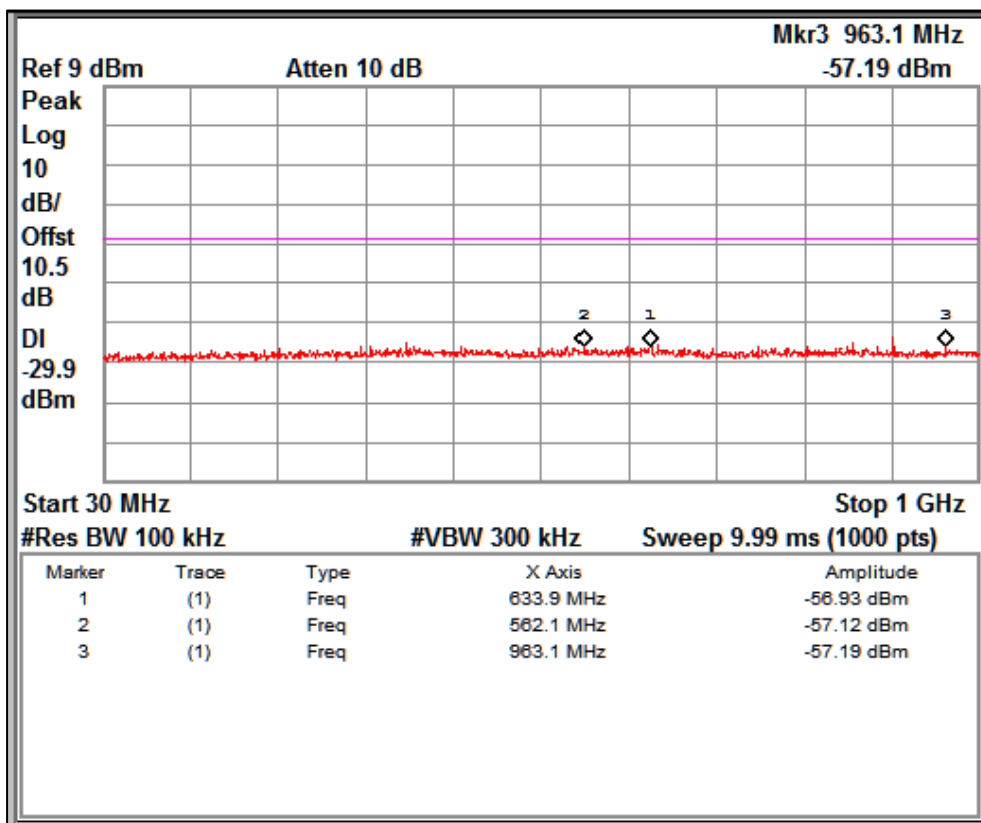
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Channel Frequency 2480MHz

Frequency Range 150 kHz – 30 MHz



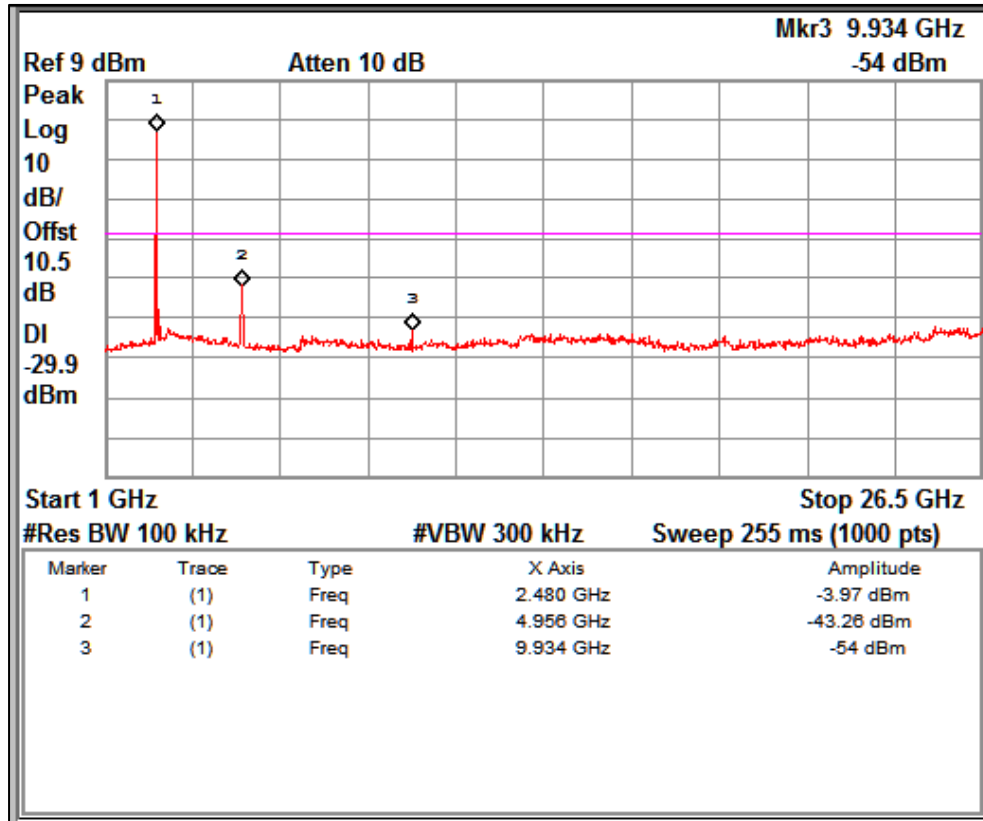
Channel Frequency 2480MHz

Frequency Range 30 MHz – 1GHz

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Channel Frequency 2480MHz

Frequency Range 1 GHz – 26.5GHz

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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)
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) = + 25 °C

Voltage = 3.3V DC Adaptor

Relative humidity = 62 %

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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

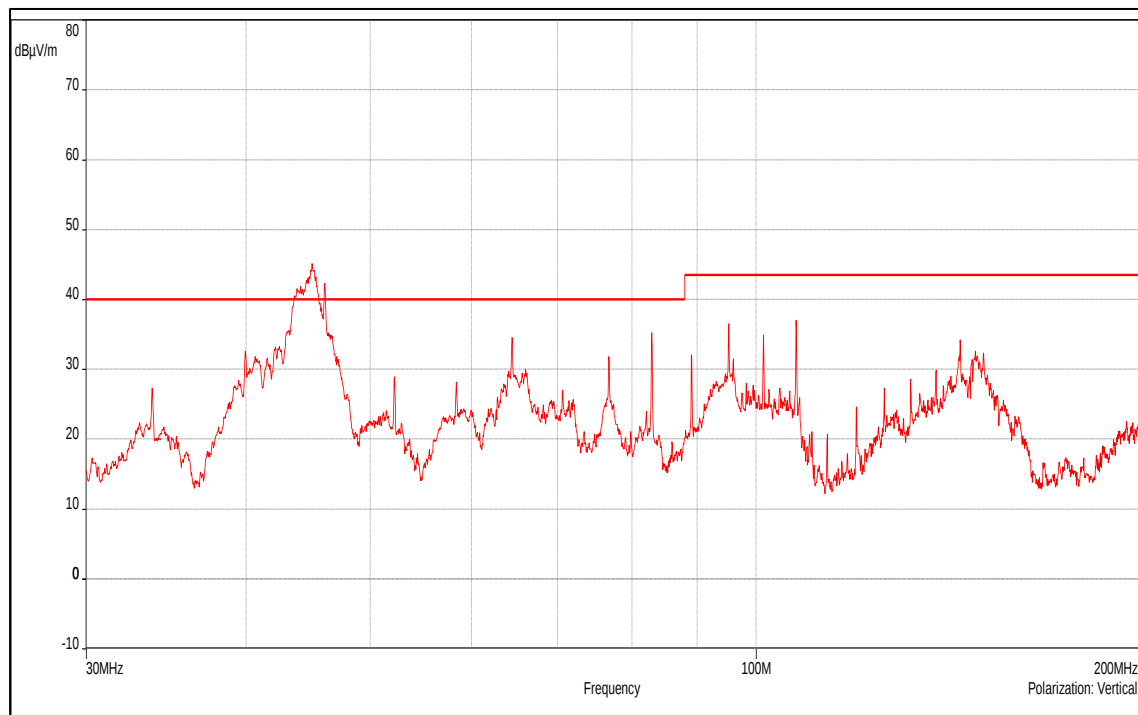
Test results for frequency range 9kHz – 30MHz

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	Measured Frequency (MHz)	Measured Value (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
Vertical	44.76	37.65 (QP)	40.00	-2.35
	46.06	39.09 (QP)	40.00	-0.91
	64.50	34.56	40.00	-5.44
	82.95	35.18	40.00	-4.82
	107.52	37.01	43.50	-6.49
	144.39	34.22	43.50	-9.28
Horizontal	45.18	21.39	40.00	-18.61
	82.95	19.24	40.00	-20.76
	95.22	21.55	43.50	-21.95
	107.55	23.67	43.50	-19.83
	150.54	23.75	43.50	-19.75

Pk: Peak Detector
QP: Quasi Peak



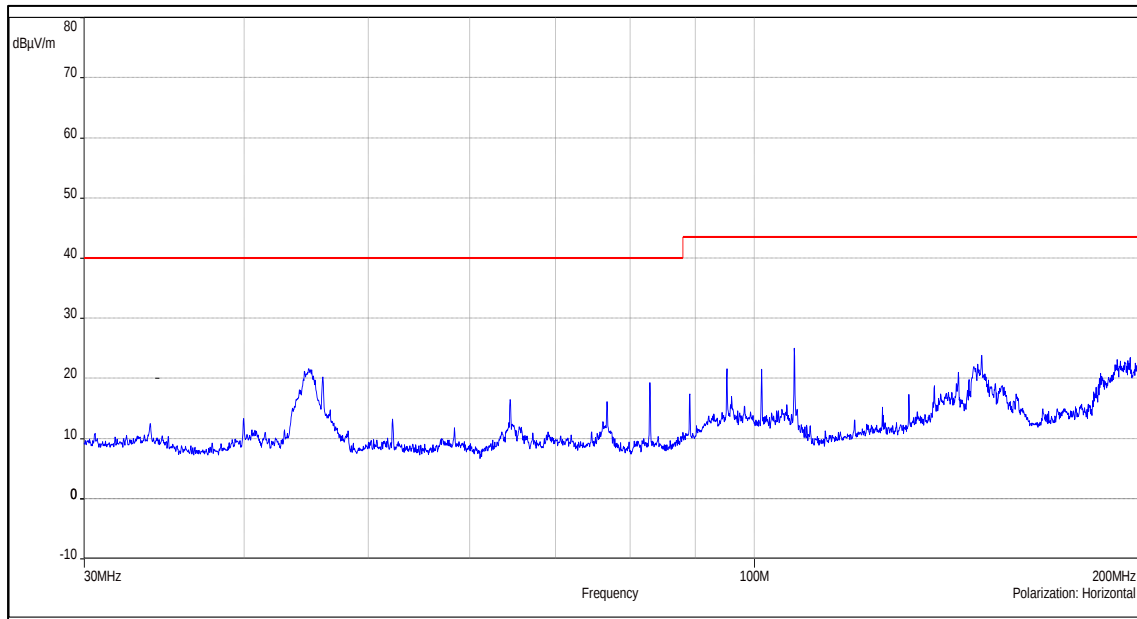
Channel Frequency 30MHz – 200MHz

Polarization Vertical

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Channel Frequency 30MHz – 200MHz

Polarization Horizontal

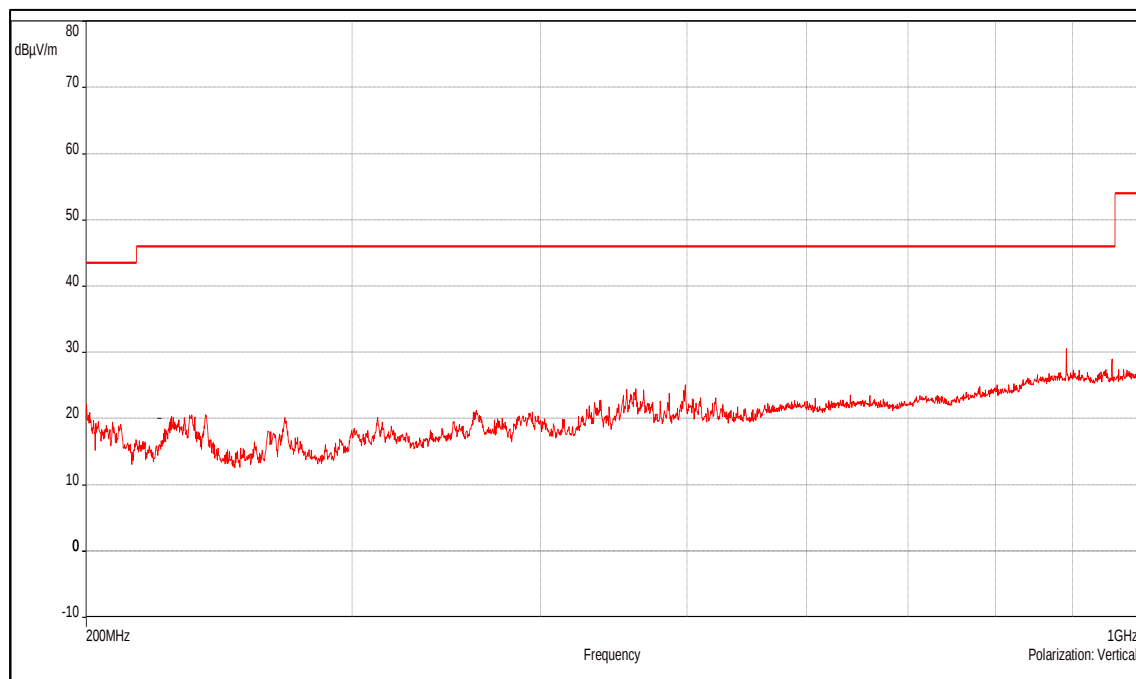
Frequency range 200MHz – 1GHz

Antenna Polarization	Measured Frequency (MHz)	Quasi Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Vertical	200.15	22.14	43.50	-21.36
	239.96	20.56	46.00	-25.44
	498.53	25.06	46.00	-20.94
	891.53	30.52	46.00	-15.48
Horizontal	200.21	17.94	43.50	-25.56
	311.96	21.09	46.00	-24.91
	362.45	22.50	46.00	-23.50
	510.56	26.29	46.00	-19.71

Prüfbericht - Nr.:
Test Report No.:

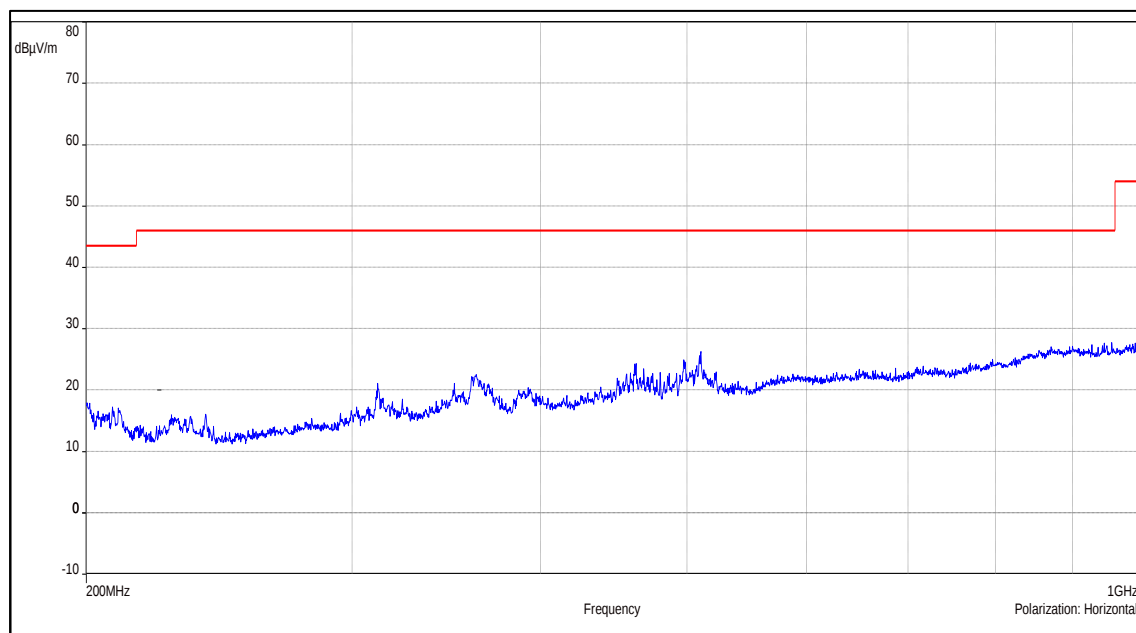
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Channel Frequency 200MHz – 1GHz

Polarization Vertical



Channel Frequency 200MHz – 1GHz

Polarization Horizontal

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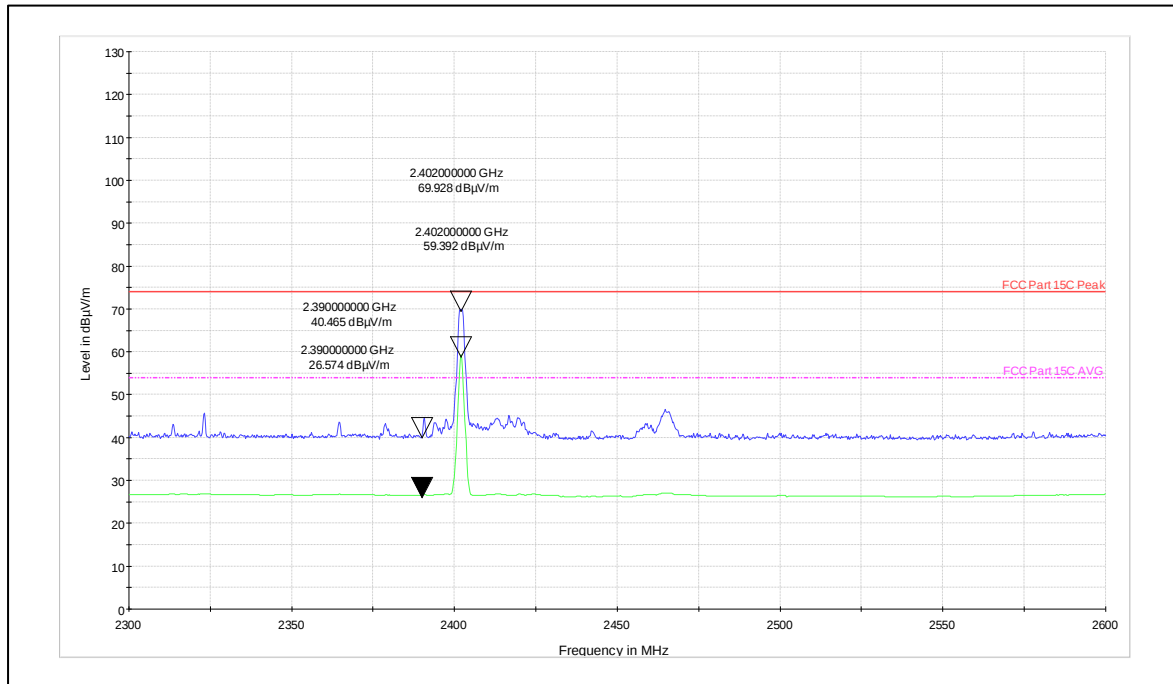
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Test results for the frequencies above 1GHz

Channel Frequency (MHz)	Antenna Polarization	Frequency (MHz)	Emission (dBµV/m)	Limit (dBm)	Margin (dB)
2402	Vertical	2402(Pk)	69.92	*	-
		2402(Av)	59.39	*	-
		2390(Pk)	40.46	74	-33.54
		2390(Av)	26.57	54	-27.43
		4804(Pk)	34.05	74	-39.95
		4804(Av)	23.04	54	-30.96
		7206(Pk)	44.75	74	-29.25
		7206(Av)	31.53	54	-22.47
	Horizontal	2402(Pk)	74.46	*	-
		2402(Av)	63.91	*	-
		2390(Pk)	40.46	74	-33.54
		2390(Av)	26.58	54	-27.42
		4804(Pk)	34.09	74	-39.91
		4804(Av)	22.85	54	-31.15
		7206(Pk)	39.84	74	-34.16
		7206(Av)	29.76	54	-24.24
2440	Vertical	2440(Pk)	68.58	*	-
		2440(Av)	57.98	*	-
		4880(Pk)	35.18	74	-38.82
		4880(Av)	22.73	54	-31.27
		7320(Pk)	41.61	74	-32.39
		7320(Av)	30.07	54	-23.93
	Horizontal	2440(Pk)	73.06	*	-
		2440(Av)	62.42	*	-
		4880(Pk)	34.25	74	-39.75
		4880(Av)	23.09	54	-30.91
2480	Vertical	7320(Pk)	42.09	74	-31.91
		7320(Av)	29.90	54	-24.10
		2483.5(Pk)	41.19	74	-32.81
		2483.5(Av)	26.39	54	-27.61
		2480(Pk)	69.24	*	-
		2480(Av)	58.67	*	-
		4960(Pk)	34.67	74	-39.33
		4960(Av)	22.61	54	-31.39
	Horizontal	7440(Pk)	41.59	74	-32.41
		7440(Av)	29.89	54	-24.11
		2483.5(Pk)	40.38	74	-33.62
		2483.5(Av)	26.46	54	-27.54
		2480(Pk)	72.76	*	-
		2480(Av)	62.18	*	-
		4960(Pk)	35.26	74	-38.74
		4960(Av)	22.69	54	-31.31
		7440(Pk)	42.94	74	-31.06
		7440(Av)	29.88	54	-24.12

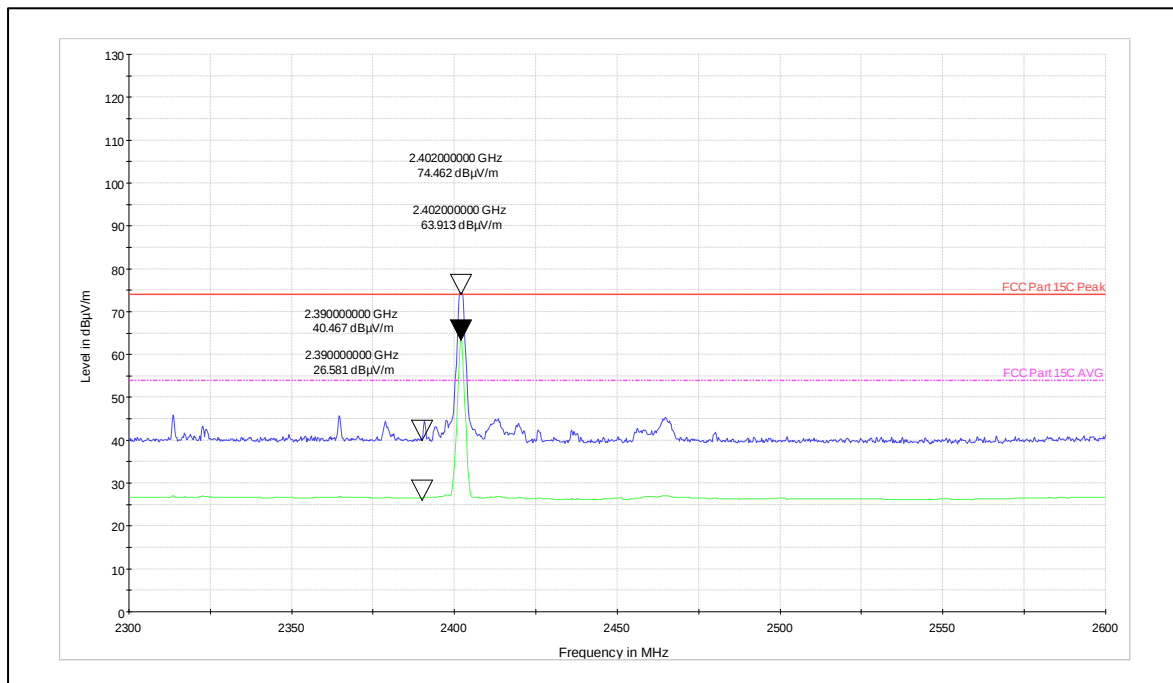
*- : Indicate restricted band of operation §15.205
Pk: Peak Detector; Av: Average Detector

Worst case Plots
Channel Frequency 2402MHz



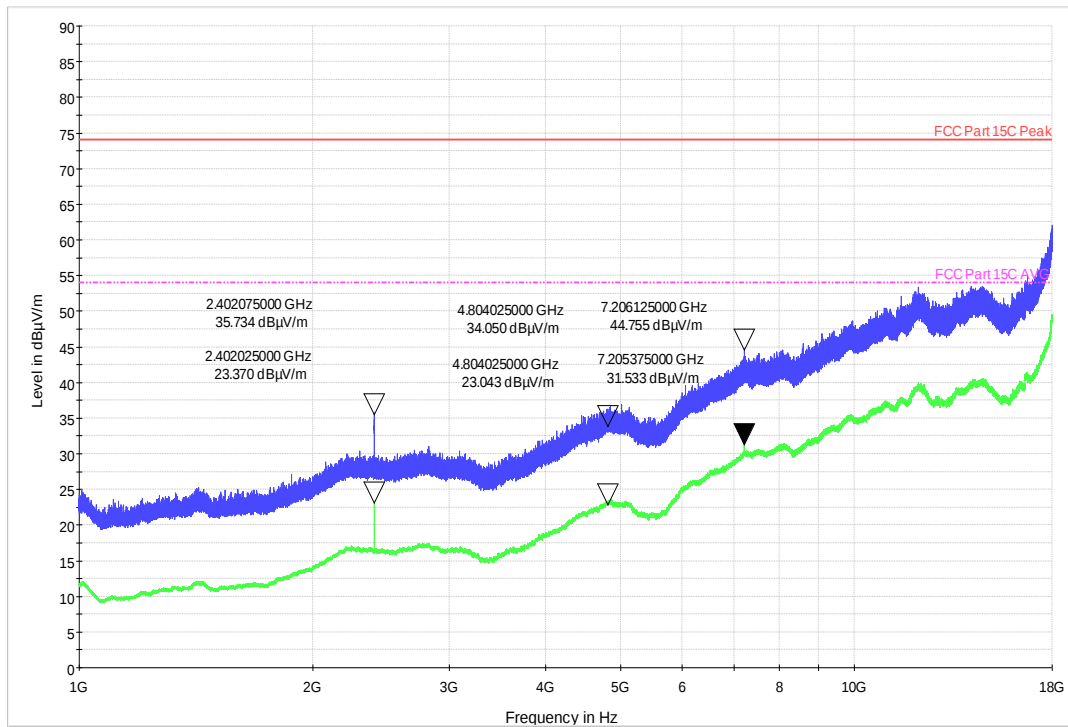
Channel Frequency: 2402MHz

Polarization: Vertical



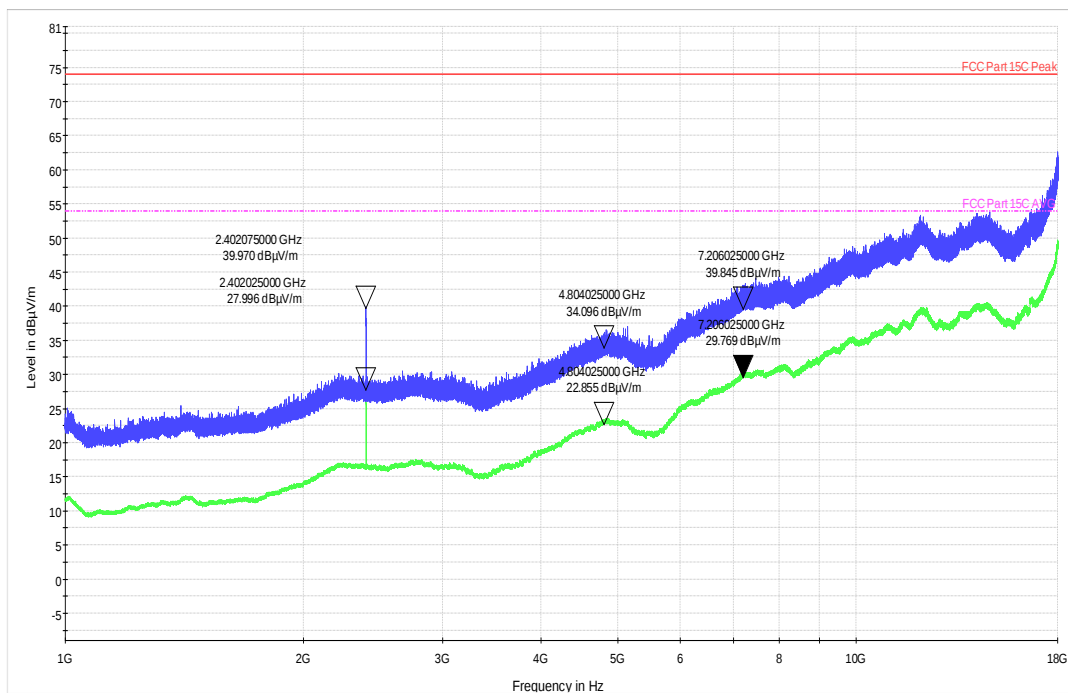
Channel Frequency: 2402MHz

Polarization: Horizontal



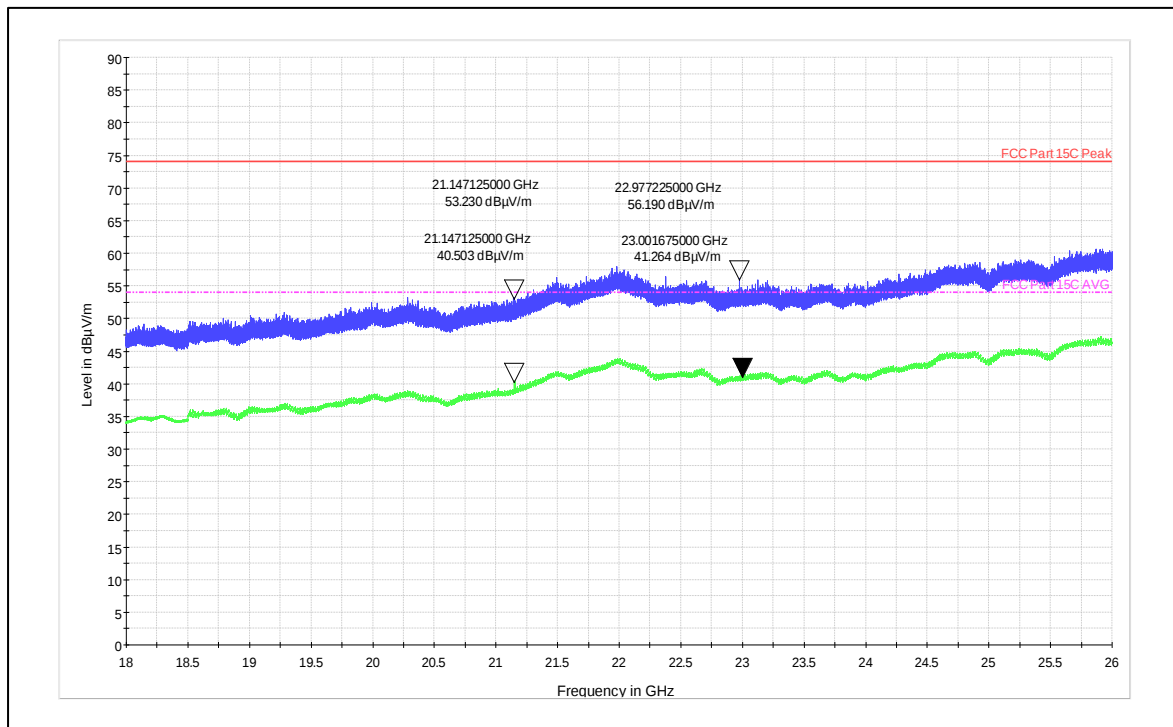
Channel Frequency: 1 - 18 GHz

Polarization: Vertical



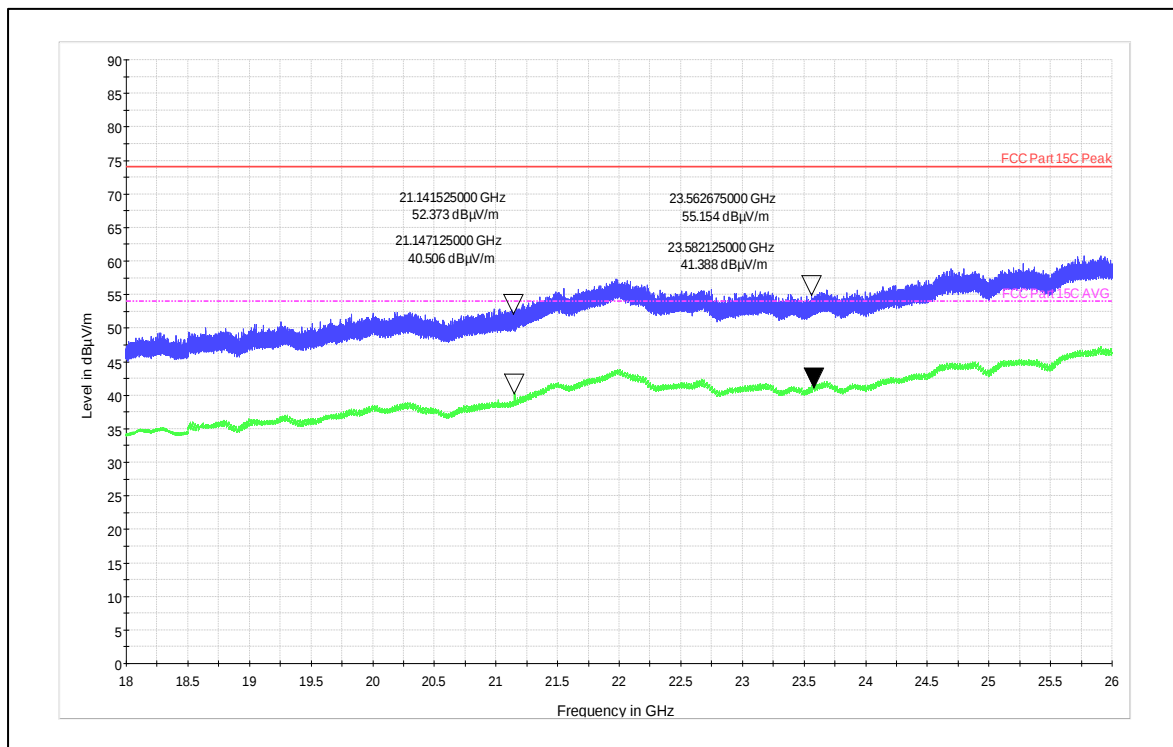
Channel Frequency: 1 - 9.9 GHz

Polarization: Horizontal



Channel Frequency: 18 - 40 GHz

Polarization: Vertical



Channel Frequency: 18 - 40 GHz

Polarization: Horizontal

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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 AC to DC adapter**

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 (Through AC to DC Adapter) Relative Humidity = 64%

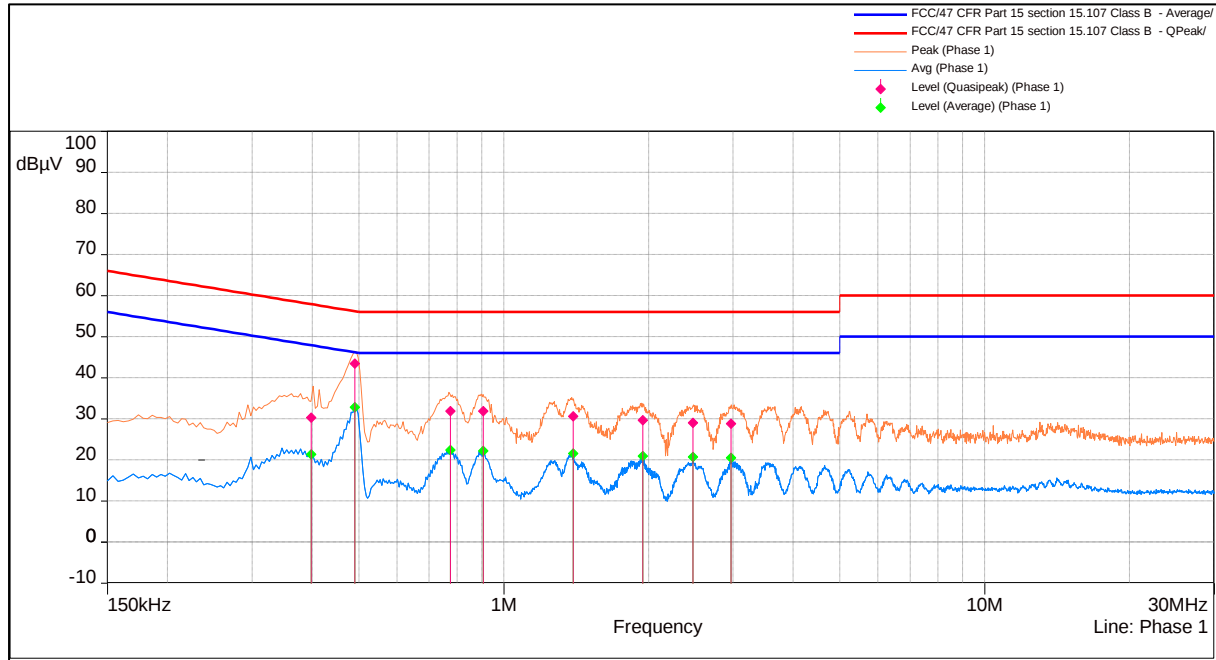
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Test result:

Power: 110V 60HZ_LINE



Line Graph

Quasipeak (15)									
Frequency (MHz)	SR	Level (dBμV)	Limit (dBμV)	Margin (dB)	Pos	Measuring time	RBW	Meas.Time	Comments
0.4909	1	43.51	56.17	-12.66	Phase 1	1	9k	0.02	Pass
0.9052	1	31.91	56	-24.09	Phase 1	1	9k	0.02	Pass
0.77405	1	31.88	56	-24.12	Phase 1	1	9k	0.02	Pass
1.3923	1	30.66	56	-25.34	Phase 1	1	9k	0.02	Pass
1.9475	1	29.65	56	-26.35	Phase 1	1	9k	0.02	Pass
2.4708	1	29.11	56	-26.89	Phase 1	1	9k	0.02	Pass
2.9668	1	28.86	56	-27.14	Phase 1	1	9k	0.02	Pass
0.39885	1	30.36	57.9	-27.53	Phase 1	1	9k	0.02	Pass

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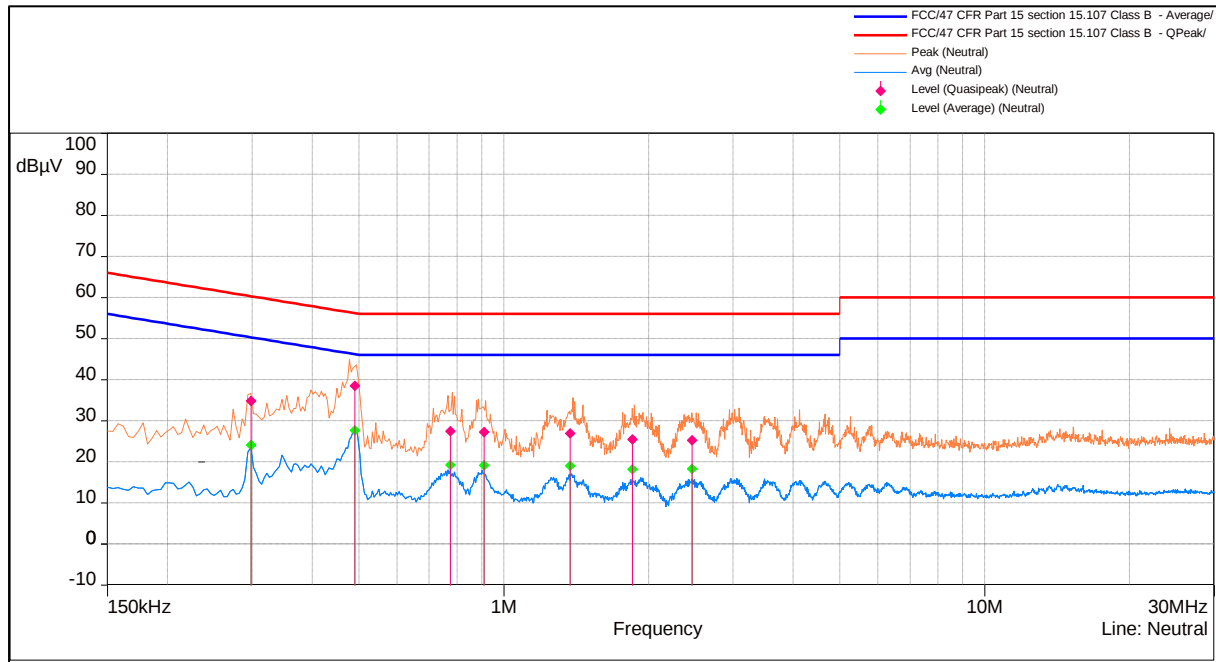
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Average (15)									
Frequency (MHz)	SR	Level (dBμV)	Limit (dBμV)	Margin (dB)	Pos	Measuring time	RBW	Meas.Time	Comments
0.4909	1	32.8	46.17	-13.37	Phase 1	1	9k	0.02	Pass
0.77405	1	22.4	46	-23.6	Phase 1	1	9k	0.02	Pass
0.9052	1	22.25	46	-23.75	Phase 1	1	9k	0.02	Pass
1.3923	1	21.62	46	-24.38	Phase 1	1	9k	0.02	Pass
1.9475	1	21	46	-25	Phase 1	1	9k	0.02	Pass
2.4708	1	20.78	46	-25.22	Phase 1	1	9k	0.02	Pass
2.9668	1	20.54	46	-25.46	Phase 1	1	9k	0.02	Pass
0.39885	1	21.38	47.9	-26.52	Phase 1	1	9k	0.02	Pass

Line Table

Power: 110V60HZ_NEUTRAL



Neutral Graph

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Quasipeak (15)									
Frequency (MHz)	SR	Level (dBμV)	Limit (dBμV)	Margin (dB)	Pos	Measuring time	RBW	Meas.Time	Comments
0.4897	2	38.54	56.17	-17.63	Neutral	1	9k	0.02	Pass
0.2971	2	34.84	60.3	-25.45	Neutral	1	9k	0.02	Pass
0.7721	2	27.45	56	-28.55	Neutral	1	9k	0.02	Pass
0.91035	2	27.32	56	-28.68	Neutral	1	9k	0.02	Pass
1.37555	2	26.98	56	-29.02	Neutral	1	9k	0.02	Pass
1.84885	2	25.52	56	-30.48	Neutral	1	9k	0.02	Pass
2.46155	2	25.25	56	-30.75	Neutral	1	9k	0.02	Pass

Average (15)									
Frequency (MHz)	SR	Level (dBμV)	Limit (dBμV)	Margin (dB)	Pos	Measuring time	RBW	Meas.Time	Comments
0.4897	2	27.7	46.17	-18.47	Neutral	1	9k	0.02	Pass
0.2971	2	24.16	50.3	-26.14	Neutral	1	9k	0.02	Pass
0.7721	2	19.26	46	-26.74	Neutral	1	9k	0.02	Pass
0.91035	2	19.2	46	-26.8	Neutral	1	9k	0.02	Pass
1.37555	2	19.07	46	-26.93	Neutral	1	9k	0.02	Pass
2.46155	2	18.33	46	-27.67	Neutral	1	9k	0.02	Pass
1.84885	2	18.24	46	-27.76	Neutral	1	9k	0.02	Pass

Neutral Table

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