

Produkte
Products

Prüfbericht - Nr.: 19660075 001		Seite 1 von 25	
<i>Test Report No.:</i>		<i>Page 1 of 25</i>	
Auftraggeber: <i>Client:</i>		ATMEL NORWAY AS VESTRE ROSTEN 79 7075 TILLER TRONDHEIM NORWAY – 7075	
Gegenstand der Prüfung: <i>Test item:</i>		REB212BSMA-EK	
Bezeichnung: <i>Identification:</i>	REB212BSMA-EK	Serien-Nr.: <i>Serial No.</i>	Engineering Sample
Wareneingangs-Nr.: <i>Receipt No.:</i>	1803029224	Eingangsdatum: <i>Date of receipt:</i>	19.02.2014
Prüfart: <i>Testing location:</i>	Refer Page 4 of 25 for test facilities		
Prüfgrundlage: <i>Test specification:</i>	FCC Part 15, Subpart C		
Prüfergebnis: <i>Test Result:</i>	Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n). <i>The test items passed the test specification(s).</i>		
Prüflaboratorium: <i>Testing Laboratory:</i>	TÜV Rheinland (India) Pvt. Ltd. 82/A, 3rd Main, West Wing, Electronic City Phase 1 Hosur Road, Bangalore – 560 100. India FCC Registration No.: 176555; IC Assigned Code: 3466E		
geprüft / tested by:		kontrolliert / reviewed by:	
06.03.2014	Saibaba Siddapur Test Engineer	10.03.2014	Raghavendra Kulkarni Sr. Manager
Datum <i>Date</i>	Name/Stellung <i>Name/Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>
Sonstiges / Other Aspects: FCC ID : VW4A91619			
Abkürzungen:	P(ass) = entspricht Prüfgrundlage F(ail) = entspricht nicht Prüfgrundlage N/A = nicht anwendbar N/T = nicht getestet	Abbreviations:	P(ass) = passed F(ail) = failed N/A = not applicable N/T = not tested
<p>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.</p> <p><i>This test report 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 safety mark on this or similar products.</i></p>			

Test Result Summary

Clause	Test Item	Result
FCC 15.247(b) (3)	Maximum Conducted Peak Output Power	Pass
FCC 15.247(a) (2)	6dB Bandwidth	Pass
FCC 15.247(e)	Power Spectral Density	Pass
FCC 15.247(d)	Band-edge compliance	Pass
FCC 15.209 / FCC 15.205	Spurious Radiated Emissions and Restricted Bands of Operation	Pass

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List of Type and Measurement Instruments

TÜV Rheinland (India) Pvt. Ltd, Bangalore

Equipment	Manufacturer	Model	S/N	Calibration Due Date
EMI Test Receiver	Rohde &Schwarz	ESU 40	100288	04.10.2014
Broadband Antenna	Frankonia	ALX-4000	ALX-4000-806	10.10.2014
Horn Antenna	Frankonia	HAX-18	HAX18-802	10.10.2014
Double-Ridged Waveguide Horn Antenna	ETS Lindgren	116706	00107323	01.11.2014
Active Loop Antenna	Frankonia	LAX-10	LAX-10-800	01.11.2014
Spectrum Analyser	Agilent Technologies	E4407B	US41192772	22.03.2014

Testing Facilities:

- 1) TÜV Rheinland (India) Private Limited
No. 108, West Wing
Electronic city Phase I
Bangalore – 560100

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General Product Information

Product Function and Intended Use

The REB212BSMA-EK is a ZigBee module of the Atmel AT86RF212B radio transceiver. The radio transceiver supports the worldwide accessible 900MHz ISM band. The system is designed standard-based applications such as ZigBee/IEEE 802.15.4, ZigBee RF4CE, and 6LoWPAN, as well as high data rate ISM applications.

Ratings and System Details

Operating Frequency	902 - 928 MHz
No. of channel	10
Channel Spacing	2 MHz
Modulation	BPSK
Transmitted Power	10.38dBm
Data Rate	40 kbps
Antenna Type	External Antenna
Number of antenna	One
Antenna Gain	0dBi
Supply Voltage	3.0VDC (Battery Operated)
Dimensions	20mm x 30mm
Environmental	-40 degrees to +85 degrees C

Test Conditions:

Voltage: 3.0V DC (External DC Power Source)

Environmental conditions:

Temperature: +23 °C **RH:** 62%

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Test Set-up and Operation Mode

Principle of Configuration Selection

Transmission was enabled with 100% duty cycle on low, mid and high channel.

Test Operation and Test Software

Test software (Atmel Studio 6.1) was used to enable the transmission with 100% duty cycle and channels in 900MHz band on the EUT for the tests in this report.

Special Accessories and Auxiliary Equipment

- None

Countermeasures to achieve EMC Compliance

- None

Table of frequencies

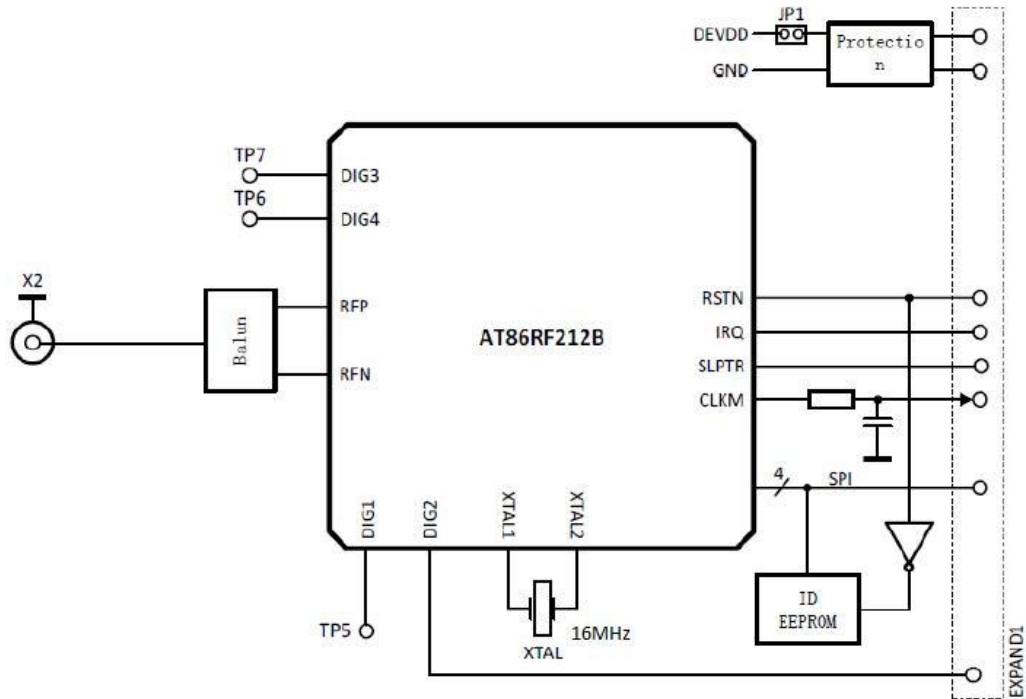
Frequency Band	Channel No.	Frequency (MHz)
902-928 MHz	1	906
	2	908
	3	910
	4	912
	5	914
	6	916
	7	918
	8	920
	9	922
	10	924

Transmitter power setting

Channel	Transmitter Power setting in dBm
906MHz	10dBm
914MHz	10dBm
924MHz	10dBm

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Block Diagram

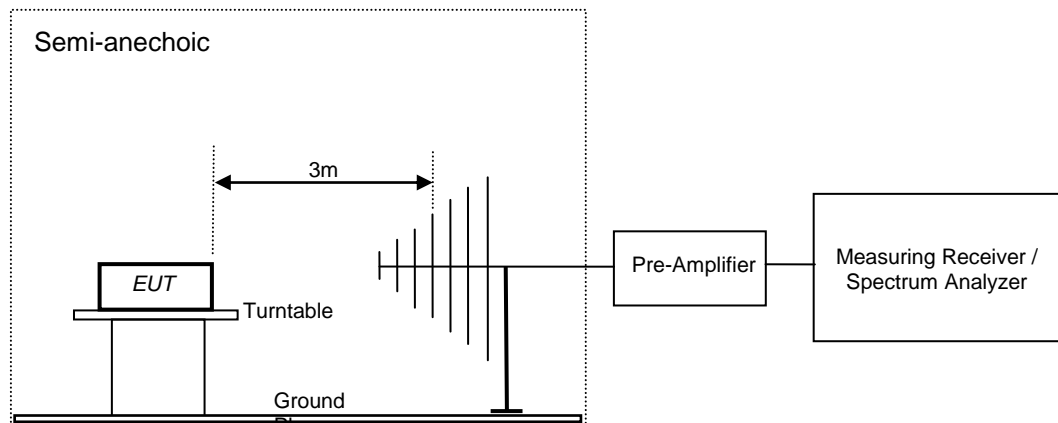


REB212BSMA

Test Methodology

Radiated Emission Test

The radiated emission measurement was performed according to the procedures in ANSI C63.4-2003. The equipment under test (EUT) was placed at the middle of the 80 cm high turntable, 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 1m and 4m, 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 1000MHz was performed by horn antenna. The measurement below 30MHz was performed by loop antenna. The EUT was rotated around the X-, Y-, and Z-Axis and the results from worst case axis are recorded.



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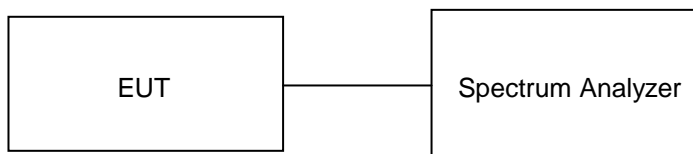
Test Results

Maximum Conducted Peak Output Power Result

Section 15.247(b) (3)
Pass

Test Specification	FCC Part 15 Subpart C
Measurement Bandwidth (RBW)	1 MHz
Detector	Peak
Requirement	<1 watt (30dBm).

Test Method:

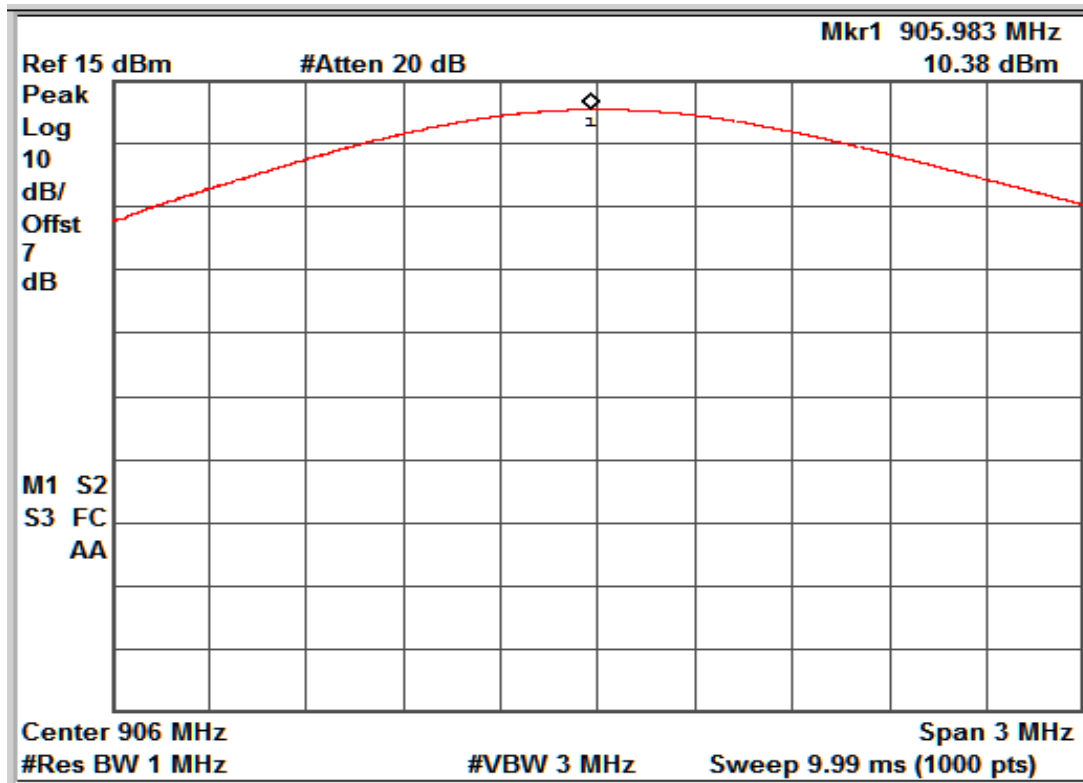


Note: Attenuator/cable (7dB) offset already part of measurement offset in spectrum analyzer.

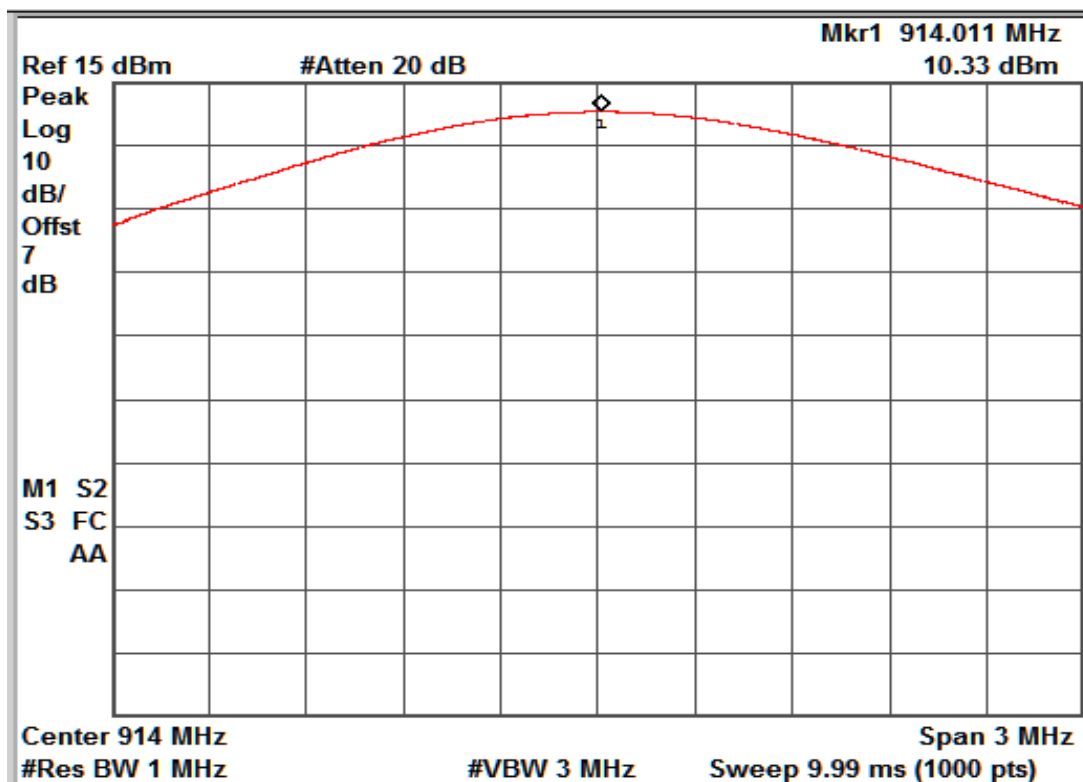
Test Result:

Frequency (MHz)	Total Output power (dBm)	Limit (dBm)	Margin (dB)
906	10.38	30	-19.62
914	10.33	30	-19.67
924	10.20	30	-19.8

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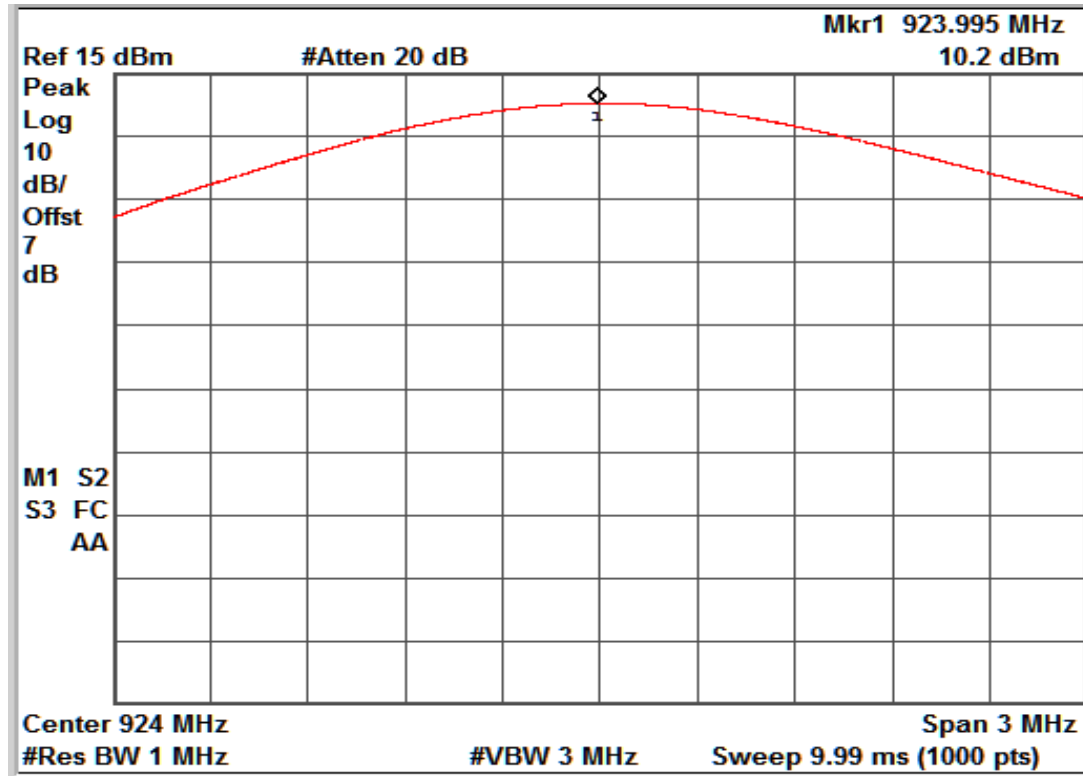


Channel Frequency: 906 MHz



Channel Frequency: 914 MHz

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Channel Frequency: 924 MHz

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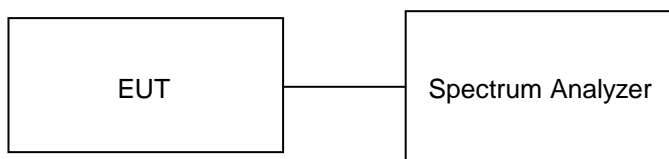
**Power Spectral Density
Result**

**Section 15.247(e)
Pass**

Test Specification
Detector Function
Requirement

FCC Part 15 Subpart C
Peak
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:

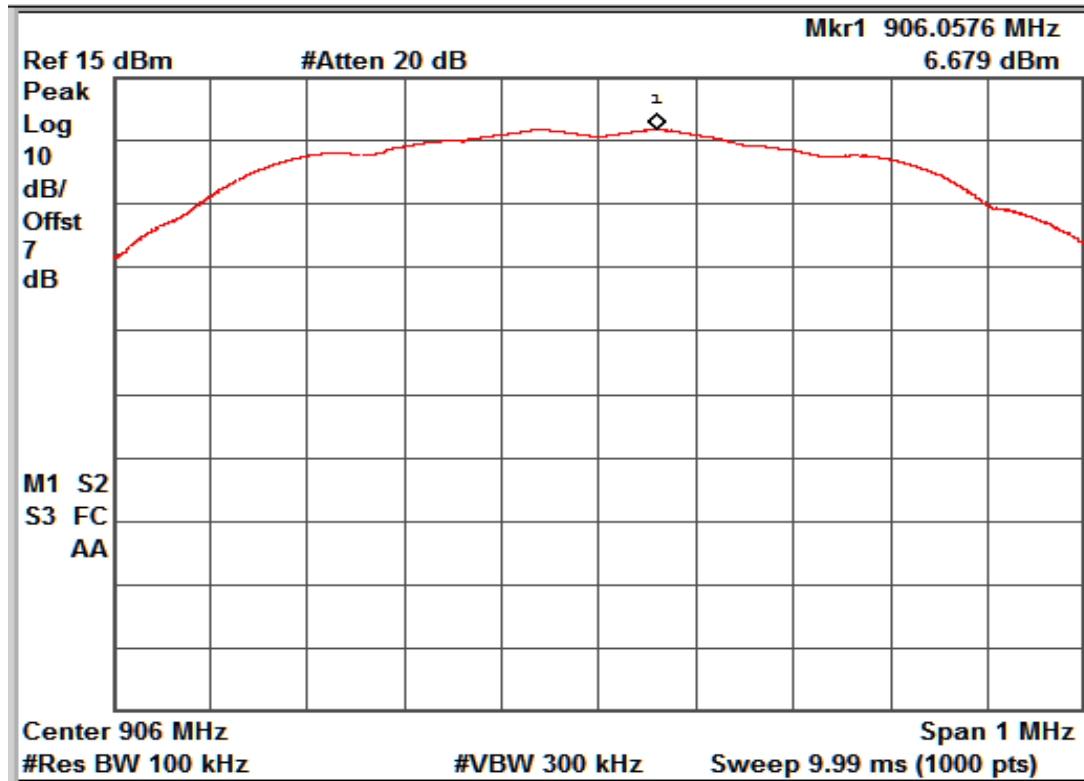


Note: Attenuator/cable (7dB) offset already part of measurement offset in spectrum analyzer.

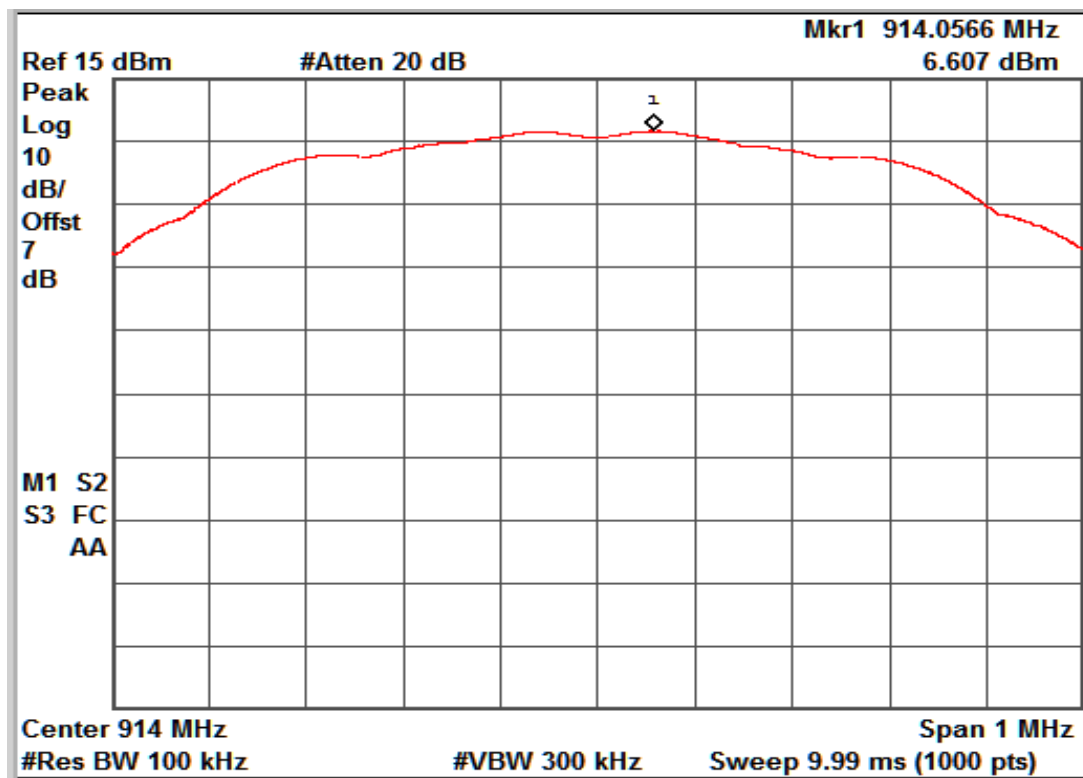
Test Result:

Frequency (MHz)	Total PSD (dBm)	Limit (dBm)	Margin (dB)
906	6.67	8	-1.33
914	6.6	8	-1.4
924	6.4	8	-1.6

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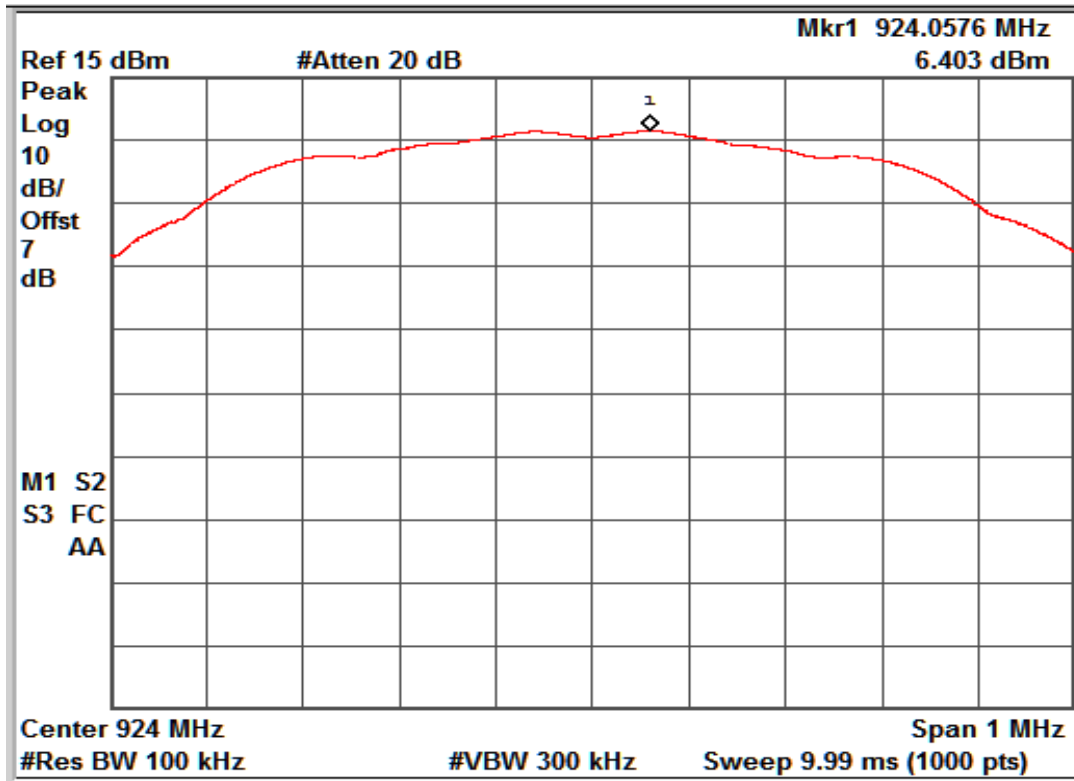


Channel Frequency: 906 MHz



Channel Frequency: 914 MHz

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Channel Frequency: 924 MHz

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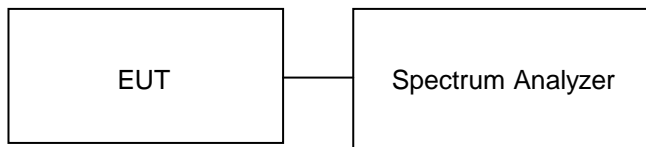
**6 dB Bandwidth
Result**

**Section 15.247(a) (2)
Pass**

Test Specification
Requirement

FCC Part 15 Subpart C
The minimum 6 dB bandwidth shall be at least 500 kHz.

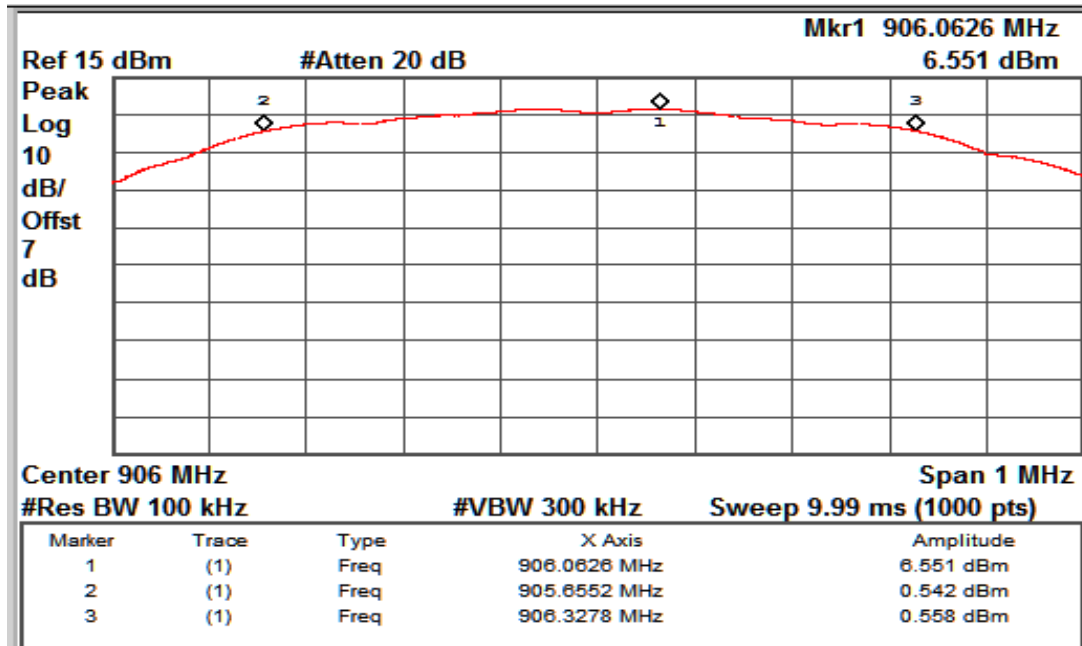
Test Method:



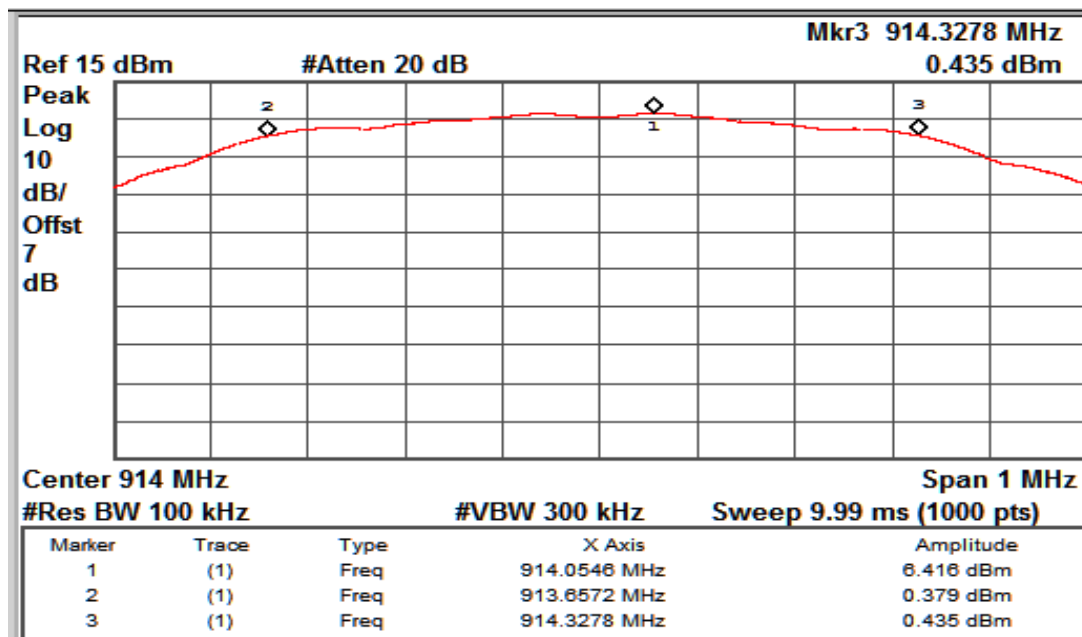
Note: Attenuator/cable (7dB) offset already part of measurement offset in spectrum analyzer.

Test Result:

Frequency (MHz)	Lower Frequency (MHz)	Upper Frequency (MHz)	6 dB Bandwidth (kHz)	OBW (kHz)
906	905.65	906.32	672	882.03
914	913.65	914.32	670	873.93
924	923.65	924.32	669	863.12

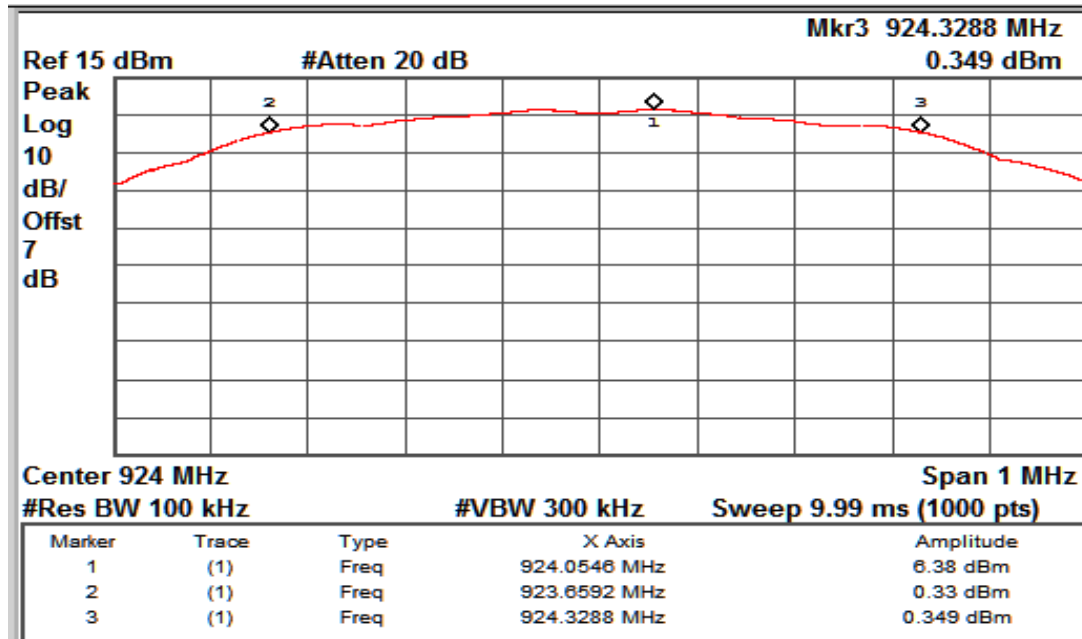


Channel frequency: 906 MHz

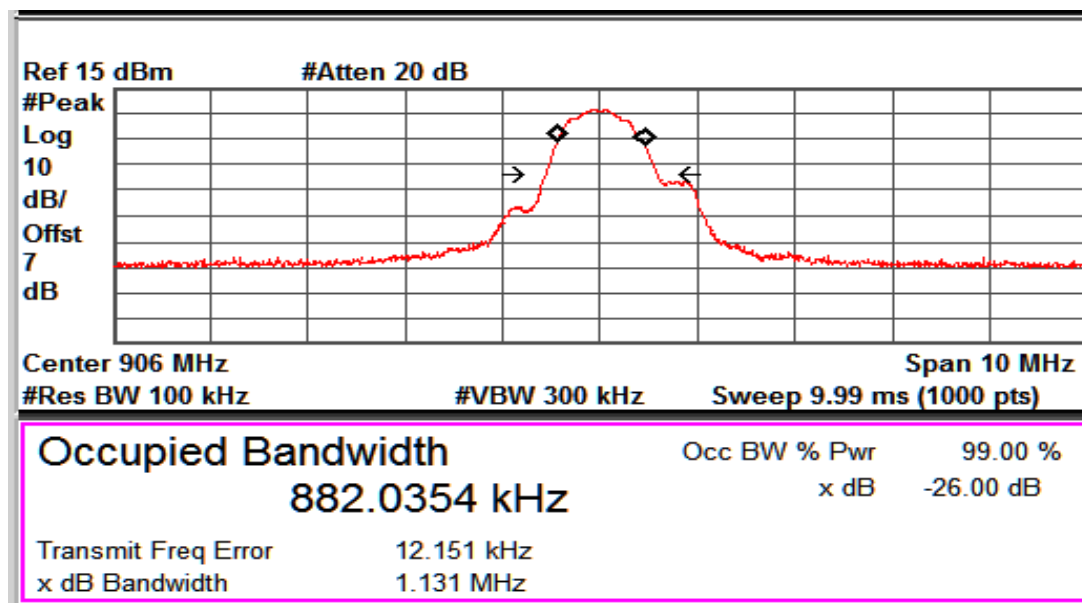


Channel frequency: 914 MHz

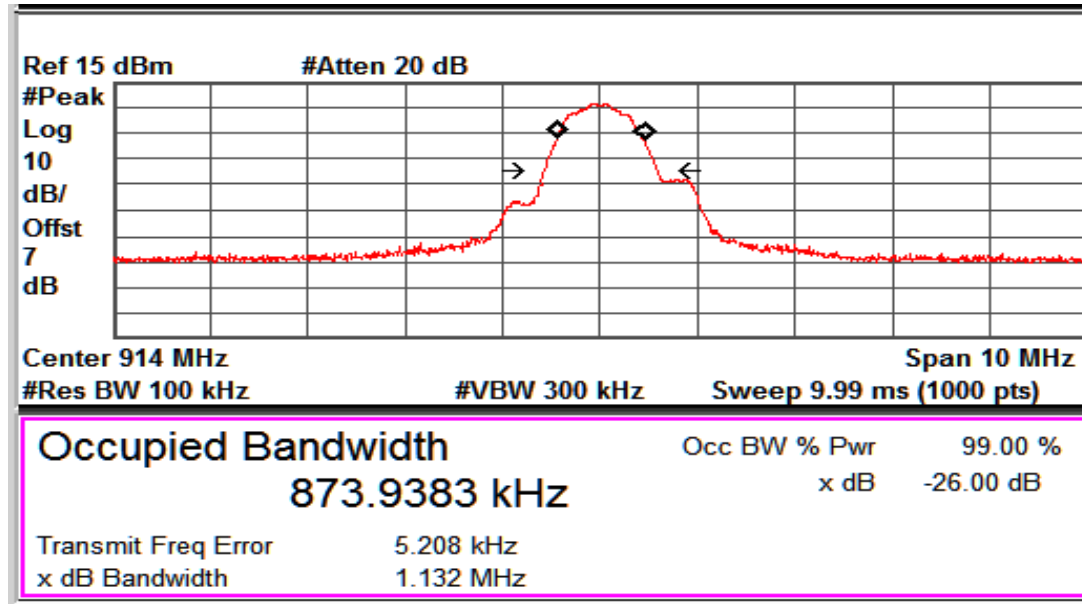
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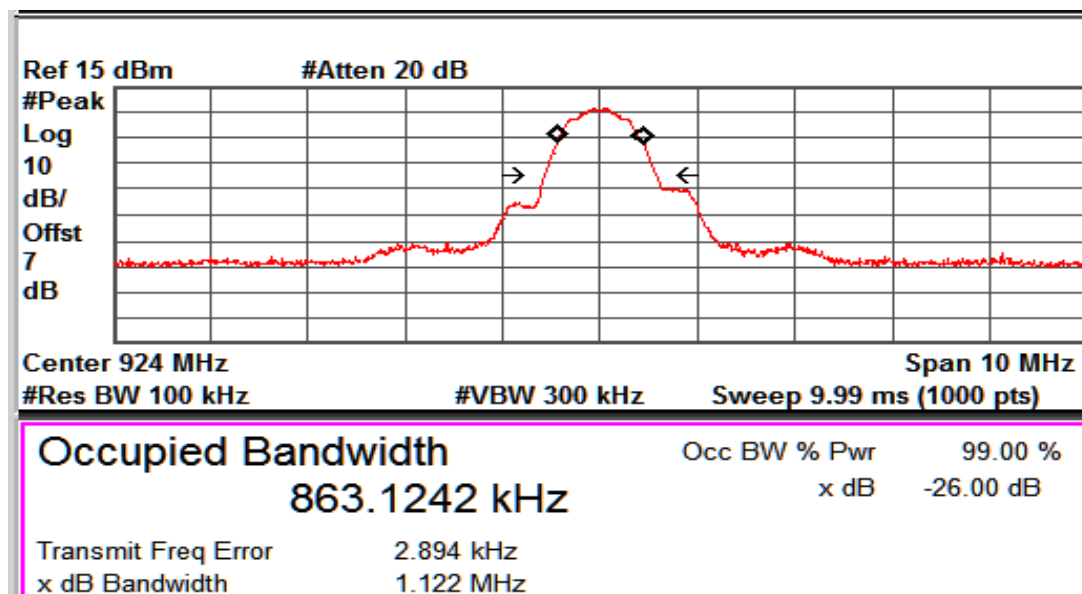
Channel frequency: 924 MHz



OBW Channel frequency: 906 MHz



OBW Channel frequency: 914 MHz



OBW Channel frequency: 924 MHz

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**Band-edge Compliance
Result**

**Section 15.247(d)
Pass**

Test Specification

FCC Part 15 Subpart C

Detector Function

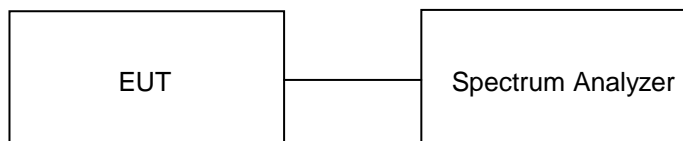
Peak

Requirement

If the peak output power procedure is used to measure the fundamental emission power to demonstrate compliance to **15.247(b)(3)** requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum measured in-band peak PSD level.

If the average output power procedure is used to measure the fundamental emission power to demonstrate compliance to 15.247(b)(3) requirements, then the power in any 100 kHz outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum measured in-band average PSD level.

Test Method:



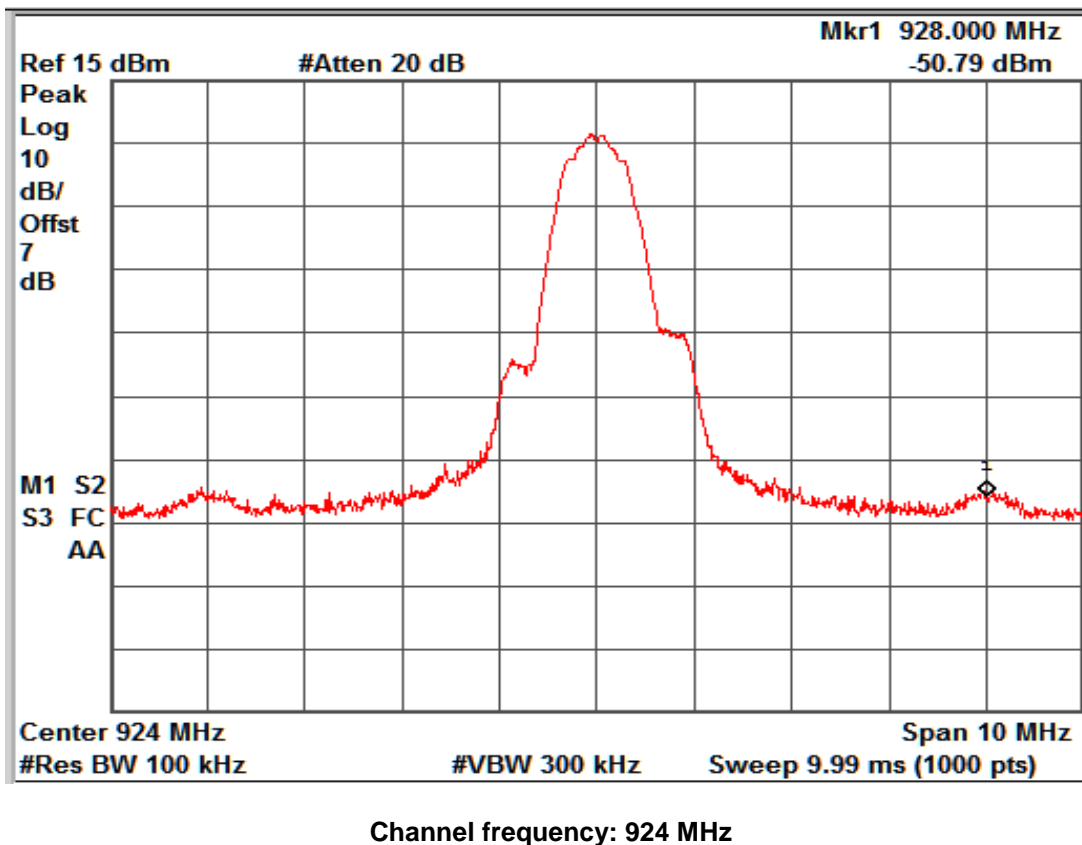
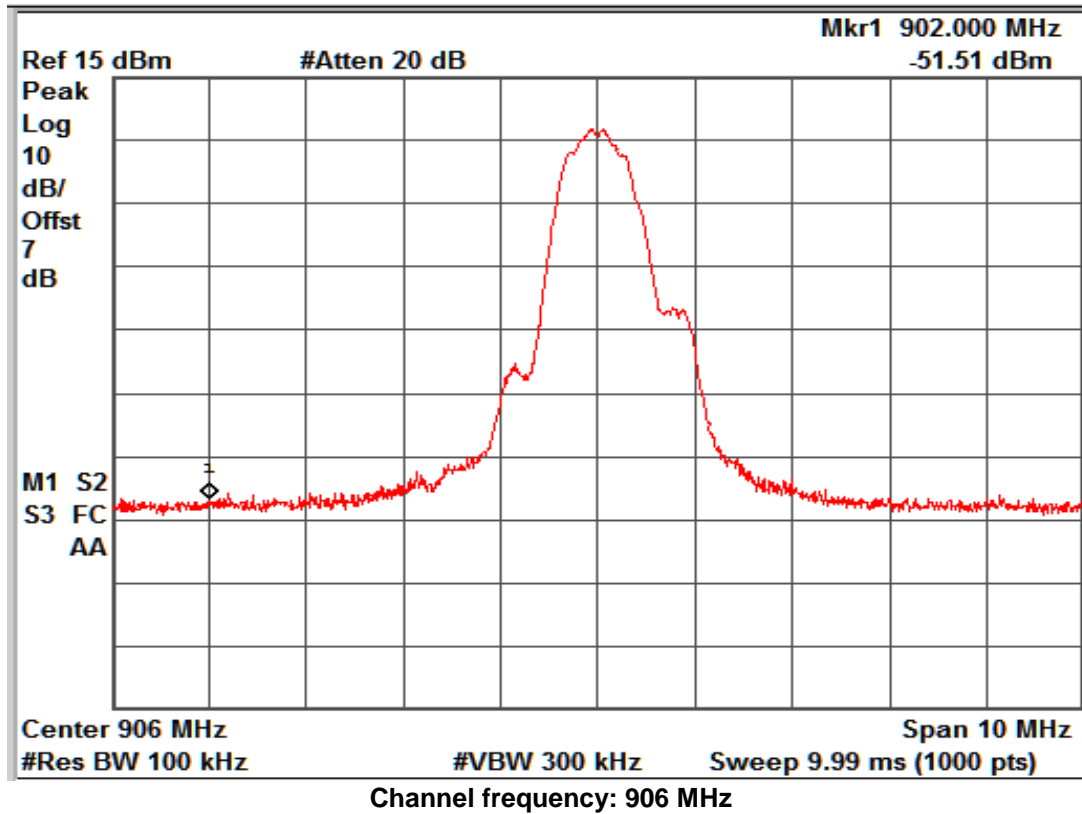
Note: Attenuator/cable (7dB) offset already part of measurement offset in spectrum analyzer.

Test Result:

Channel Frequency (MHz)	Value at Band Edge				Limit (dB)
	Band Edge Frequency (MHz)	Measured PSD Level*	Band Edge Value (dBm)	Value (dBc)	
906	902	6.67	-51.51	-58.18	-20.00
924	928	6.4	-50.79	-57.19	-20.00

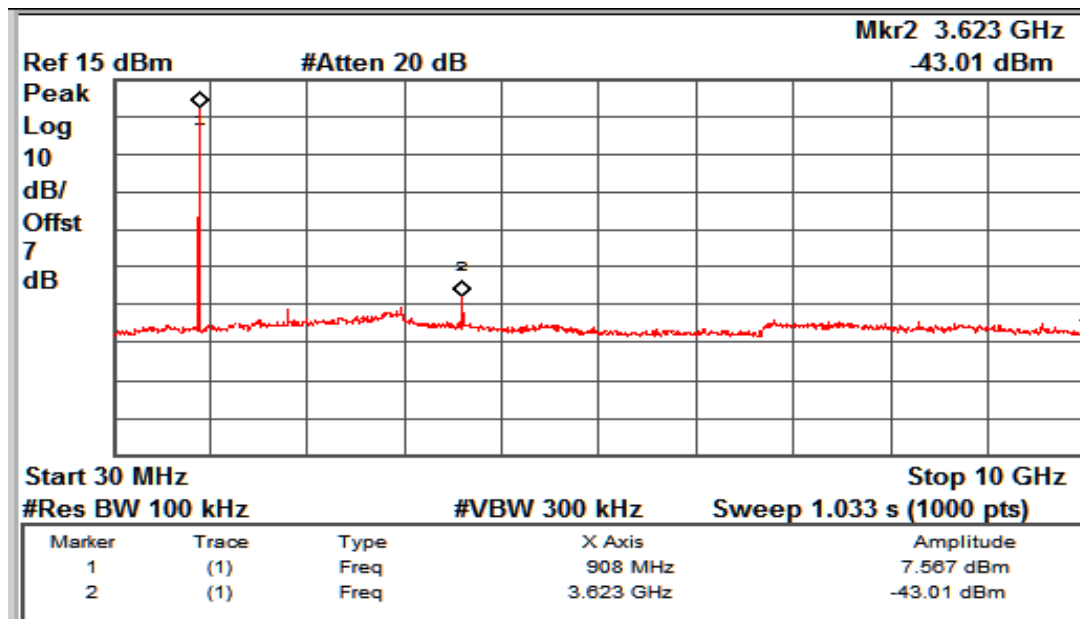
Note: The reference values are taken from the plots reported under the Power spectral Density Section 15.247(e).

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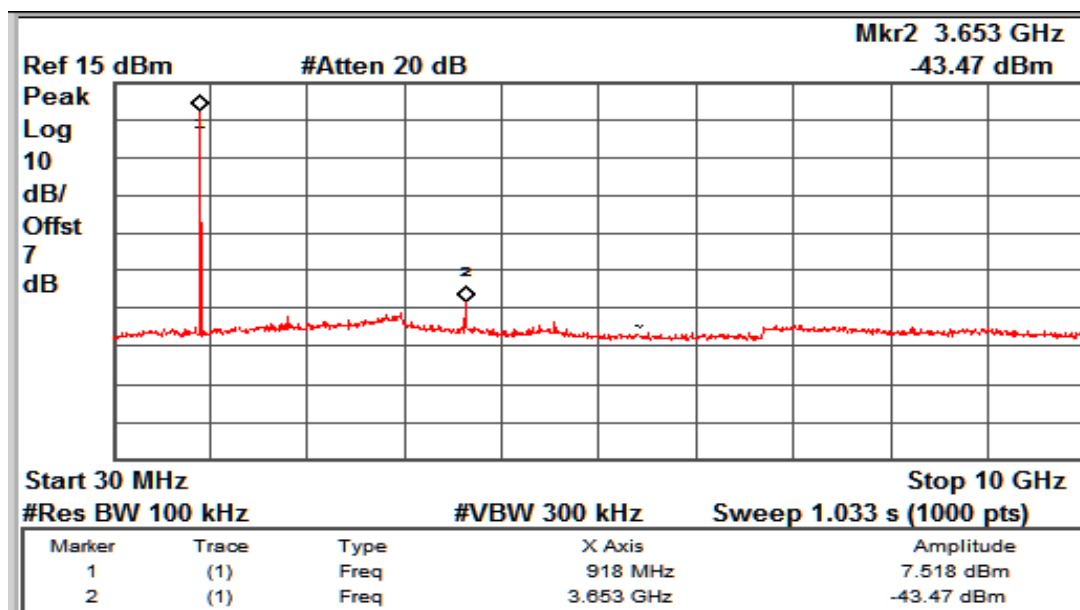


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Conducted Spurious Emission

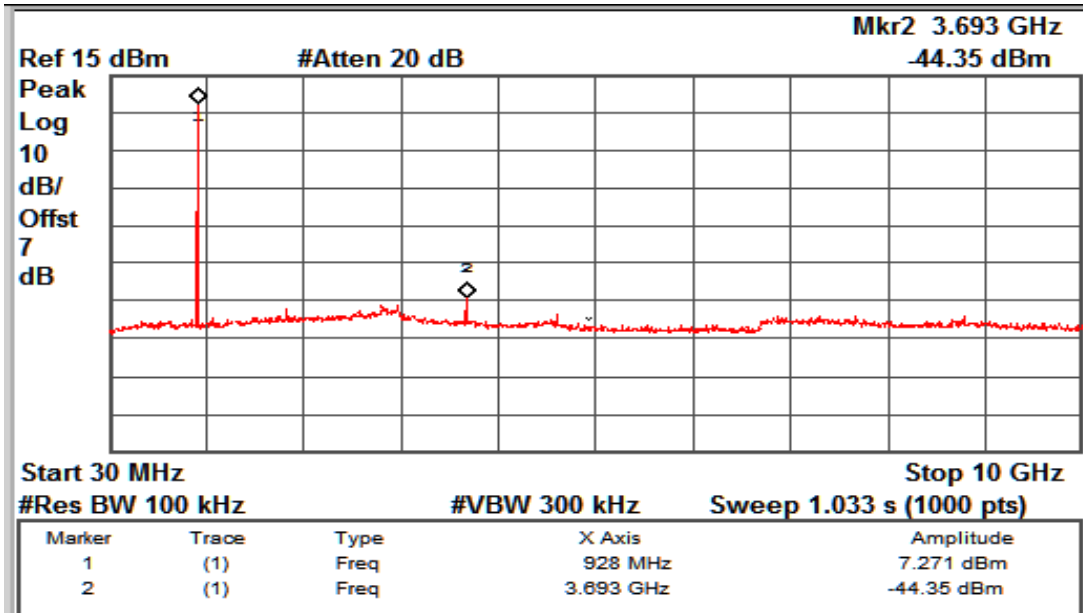


Channel frequency: 906 MHz



Channel frequency: 914 MHz

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Channel frequency: 924 MHz

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**Spurious Radiated Emissions and
Restricted Bands of Operation
Result**

**Section 15.209 and 15.205
Pass**

Test Specification	FCC Part 15 Subpart C
Test Method	ANSI C63.4-2003
Measurement Location	Semi Anechoic Chamber
Measuring Distance	3m
Detection	QP for frequency below 1GHz, Peak and Average for frequency above 1GHz
Requirement	As per the limits mentioned in the bellow table

Limit for Radiated Emission of Section 15.209:

Frequency (MHz)	Field strength ($\mu\text{V/m}$)	Field strength (dB $\mu\text{V/m}$)	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 88, 50 – 53.80, 53.80 – 43.00 and 49.5dB $\mu\text{V/m}$ 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 result:

Channel	Polarization	Frequency (MHz)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
Low	Vertical	906.10	103.82	*	-
		1812.2(Pk)	41.61	74	-32.39
		1812(Av)	34.47	54	-19.53
		2718.1(Pk)	43.23	74	-30.77
		27189(Av)	33.95	54	-20.05
		3623.9(Pk)	52.33	74	-21.67
		3624(Av)	44.61	54	-9.39
		4529.8(Pk)	49.23	74	-24.77
		4530(Av)	38.17	54	-15.83
	Horizontal	906.18	91.58	*	-
		1812(Pk)	42.39	74	-31.61
		1812(Av)	37.24	54	-16.76
		2717.9(Pk)	44.59	74	-29.41
		2718(Av)	35.71	54	-18.29
		3624.1(Pk)	52.74	74	-21.26
		3624(Av)	44.38	54	-9.62
		4530.2(Pk)	52.65	74	-21.35
		4530(Av)	44.07	54	-9.93
Mid	Vertical	914.04	103.71	*	-
		1827.9(Pk)	40.39	74	-33.61
		1828(Av)	32.85	54	-21.15
		2741.7(Pk)	40.07	74	-33.93
		2742(Av)	29.51	54	-24.49
		3656.1(Pk)	53.87	74	-20.13
		3656(Av)	46.40	54	-7.60
		4570(Pk)	49.42	74	-24.58
		4570(Av)	37.80	54	-16.20
	Horizontal	914.05	90.61	*	-
		1828(Pk)	43.59	74	-30.41
		1828(Av)	37.91	54	-16.09
		2741.9(Pk)	43.86	74	-30.14
		2742(Av)	34.74	54	-19.26
		3656.1(Pk)	53.01	74	-20.99
		3656(Av)	44.76	54	-9.24
		4570(Pk)	54.59	74	-19.41
		4570(Av)	47.09	54	-6.91
High	Vertical	924.04	104.79	*	-
		1848(Pk)	40.11	74	-33.89
		1848(Av)	33.48	54	-20.52
		2772.1(Pk)	41.29	74	-32.71
		2772(Av)	30.73	54	-23.27
		3696.1(Pk)	54.09	74	-19.91
		3696(Av)	46.88	54	-7.12
		4620(Pk)	49.13	74	-24.87
		4620(Av)	37.42	54	-16.58
	Horizontal	924.04	95.01	*	-
		1848.1(Pk)	42.75	74	-31.25
		1848(Av)	37.36	54	-16.64
		2772.1(Pk)	42.47	74	-31.53
		2772(Av)	32.54	54	-21.46
		3696.1(Pk)	52.17	74	-21.83
		3696(Av)	44.57	54	-9.43

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		4620(Pk)	53.05	74	-20.95
		4620(Av)	44.77	54	-9.23

* - -> Fundamental Frequency