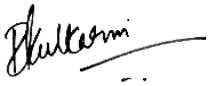
Produkte
Products

Prüfbericht - Nr.: *Test Report No.:*	**19660043 001**	**Seite 1 von 27** *Page 1 of 27*

Auftraggeber: *Client:*	**ATMEL NORWAY AS** **VESTRE ROSTEN 79** **7075 TILLER** **TRONDHEIM** **NORWAY - 7075**		
Gegenstand der Prüfung: *Test item:*	**ZigBit ATxmega256A3U+RF212B**		
Bezeichnung: *Identification:*	**ATZB-X0-256-4-0-CN**	**Serien-Nr.:** *Serial No.*	**Engineering Sample**
Wareneingangs-Nr.: *Receipt No.:*	**1803001642**	**Eingangsdatum:** *Date of receipt:*	**07.11.2013**
Prüfort: *Testing location:*	**Refer Page 4 of 27 for test facilities**		
Prüfgrundlage: *Test specification:*	**FCC Part 15, Subpart C**		
Prüfergebnis: *Test Result:*	**Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n).** *The test items passed the test specification(s).*		
Prüflaboratorium: *Testing Laboratory:*	**TÜV Rheinland (India) Pvt. Ltd.** 82/A, 3rd Main, West Wing, Electronic City Phase 1 Hosur Road, Bangalore – 560 100. India		

geprüft / *tested by:*			**kontrolliert /** *reviewed by:*		
07.11.2013	Saibaba Siddapur Test Engineer		08.11.2013	Raghavendra Kulkarni Sr.Manager	
Datum *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*	**Datum** *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*

Sonstiges /*Other Aspects:* **FCC ID : VW4A091745**

Abkürzungen:				***Abbreviations:***			
P(ass)	=	***entspricht Prüfgrundlage***		***P(ass)***	=	***passed***
F(ail)	=	***entspricht nicht Prüfgrundlage***		***F(ail)***	=	***failed***
N/A	=	***nicht anwendbar***		***N/A***	=	***not applicable***
N/T	=	***nicht getestet***		***N/T***	=	***not tested***

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
FCC 15.207	Conducted Emissions on A.C Power lines	Pass

Content

www.tuv.com

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

General Product Information

Product Function and Intended Use

The ZigBit ATxmega256A3U + RF212B are a ZigBit module with the Atmel ATxmega256A3U microcontroller and AT86RF212B radio transceiver.
The system is designed for standard-based applications such as ZigBee/IEEE 802.15.4, ZigBee RF4CE, and 6LoWPAN, as well as high data rate ISM applications. The MS147 connector allows conducting RF Performance measurements

Ratings and System Details

Operating Frequency	902 - 928 MHz
No. of channel	10
Channel Spacing	2 MHz
Modulation	DSSS [BPSK]
Transmitted Power	10.54dBm
Data Rate	250 kbps
Antenna Type	Ceramic Chip Antenna
Number of antenna	One
Antenna Gain	0dBi
Supply Voltage	1.8VDC – 3.6VDC
Dimensions	20mm x 38.5mm
Environmental	-20 to +85 degrees C

Test Conditions:

Voltage: 5 V DC (Power from USB adaptor)

Environmental conditions:

Temperature: +23 º C **RH:** 62%

Test Set-up and Operation Mode

Principle of Configuration Selection

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

Test Operation and Test Software

Hyper terminal in the computer used to enable the continuous transmission and changing channels (low/mid/high) on the EUT for the tests in this report

Special Accessories and Auxiliary Equipment

- None

Countermeasures to achieve EMC Compliance

- None

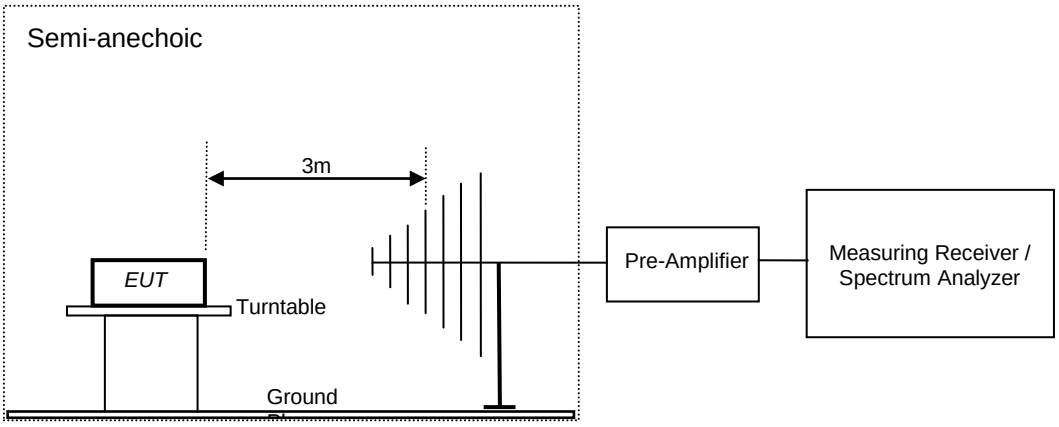
Table of frequencies

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

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.



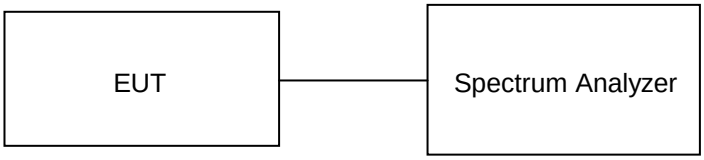
Test Results

Maximum Conducted Peak Output Power **Section 15.247(b) (3)**

Result **Pass**

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

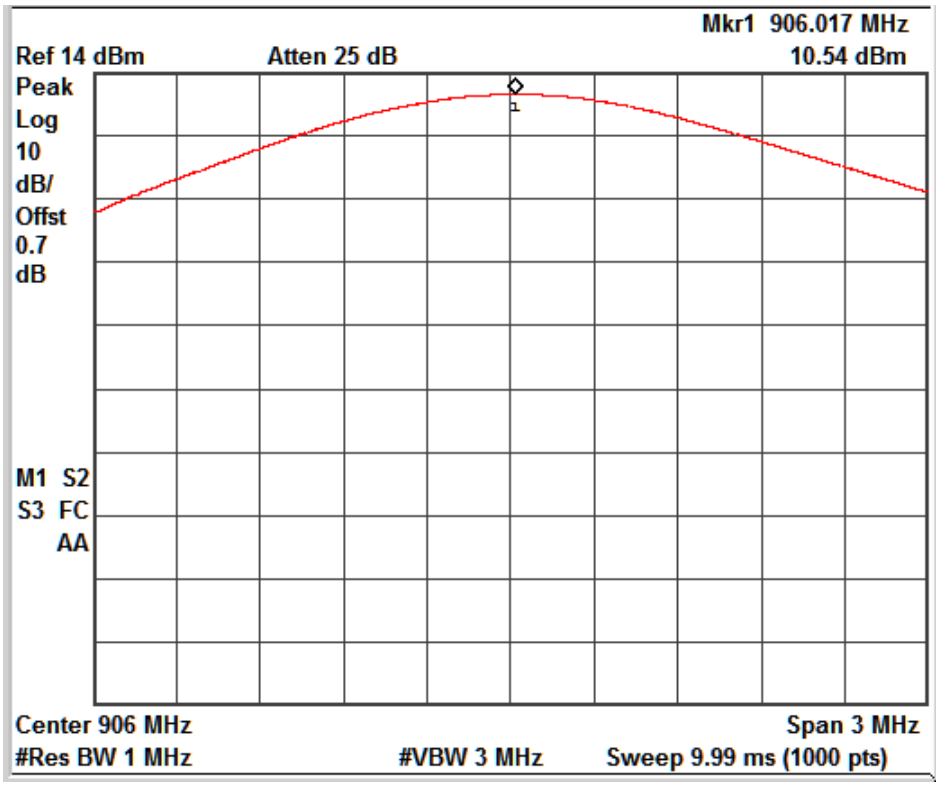
Test Method:



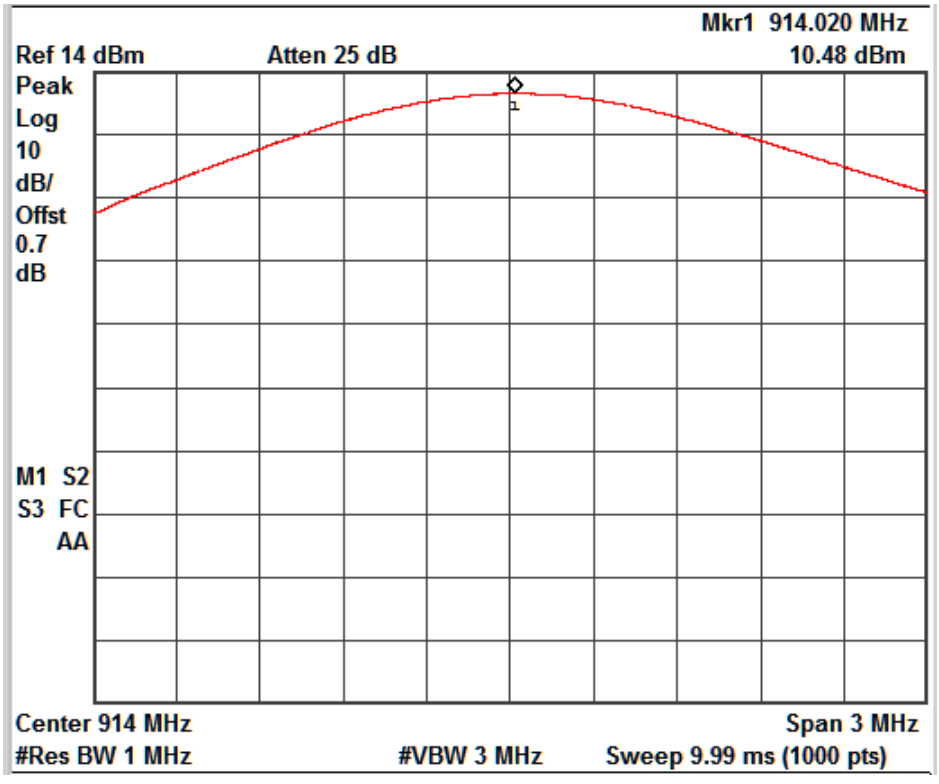
Test Result:

Cable Loss: 0.7dB (Included in the test results)

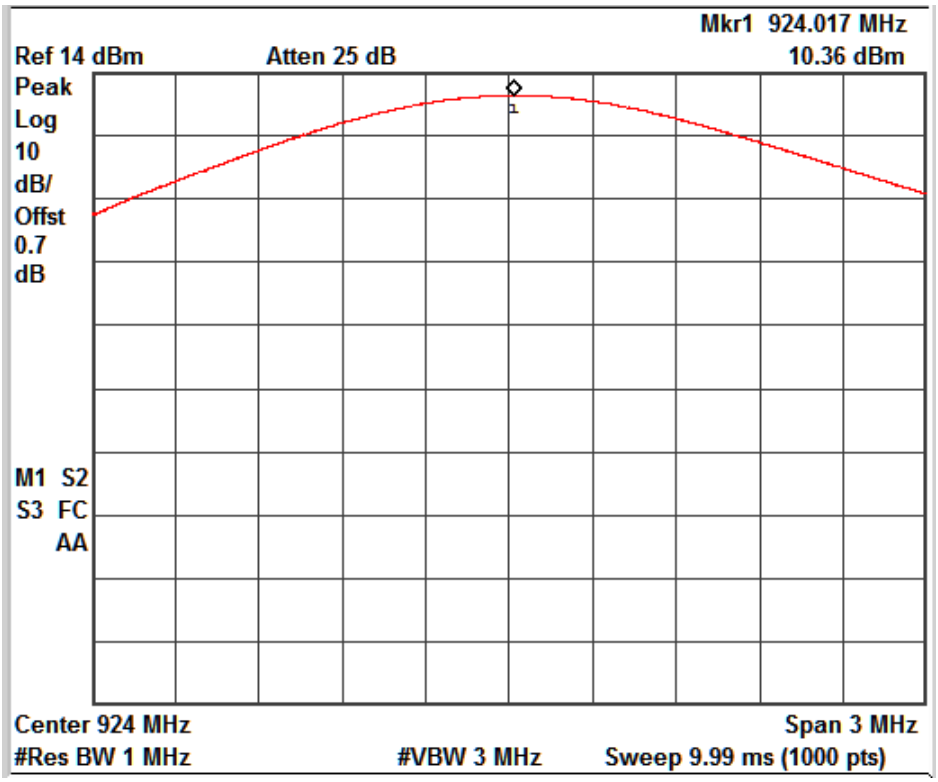
Frequency (MHz)	Total Output power (dBm)	Limit (dBm)	Margin (dB)
906	10.54	30	-19.46
914	10.48	30	-19.52
924	10.36	30	-19.64



Channel Frequency: 906 MHz



Channel Frequency: 914 MHz



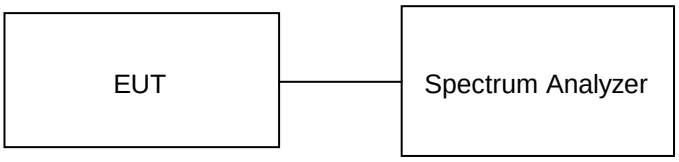
Channel Frequency: 924 MHz

Power Spectral Density **Section 15.247(e)**

Result **Pass**

Test Specification	FCC Part 15 Subpart C
Detector Function	Peak
Requirement	For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm.

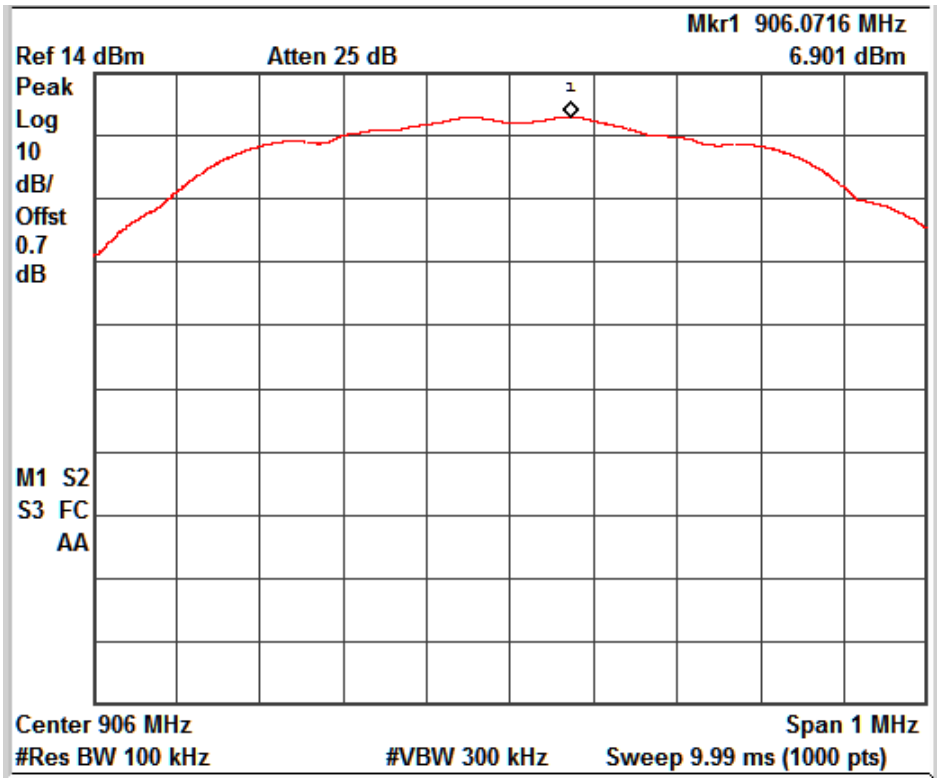
Test Method:



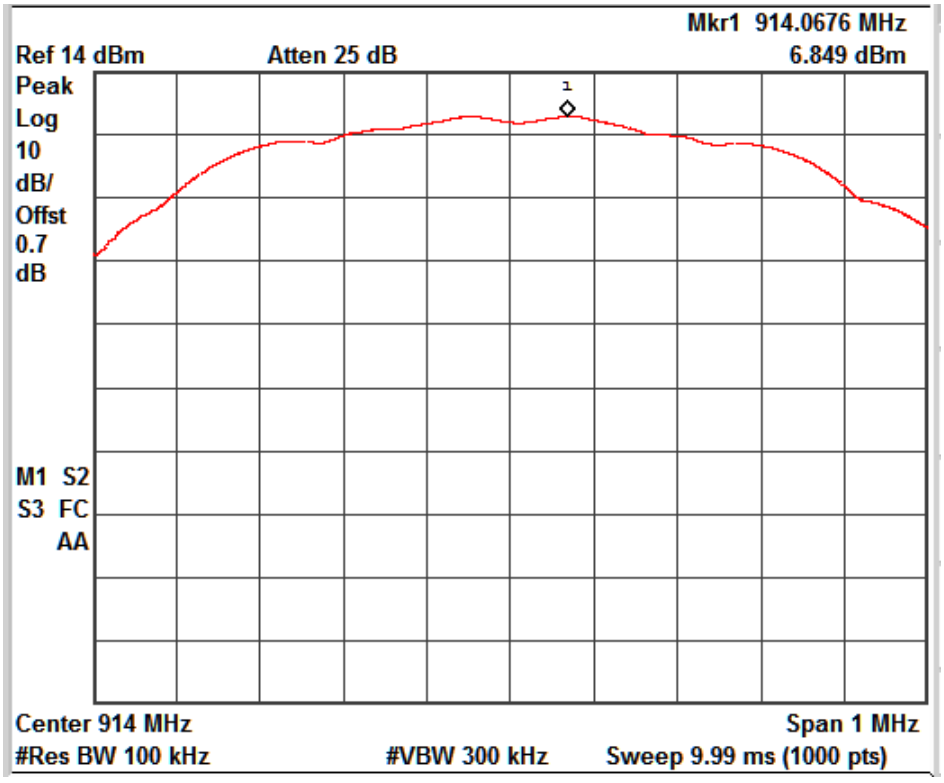
Test Result:

Cable Loss: 0.7dB (Included in the test results)

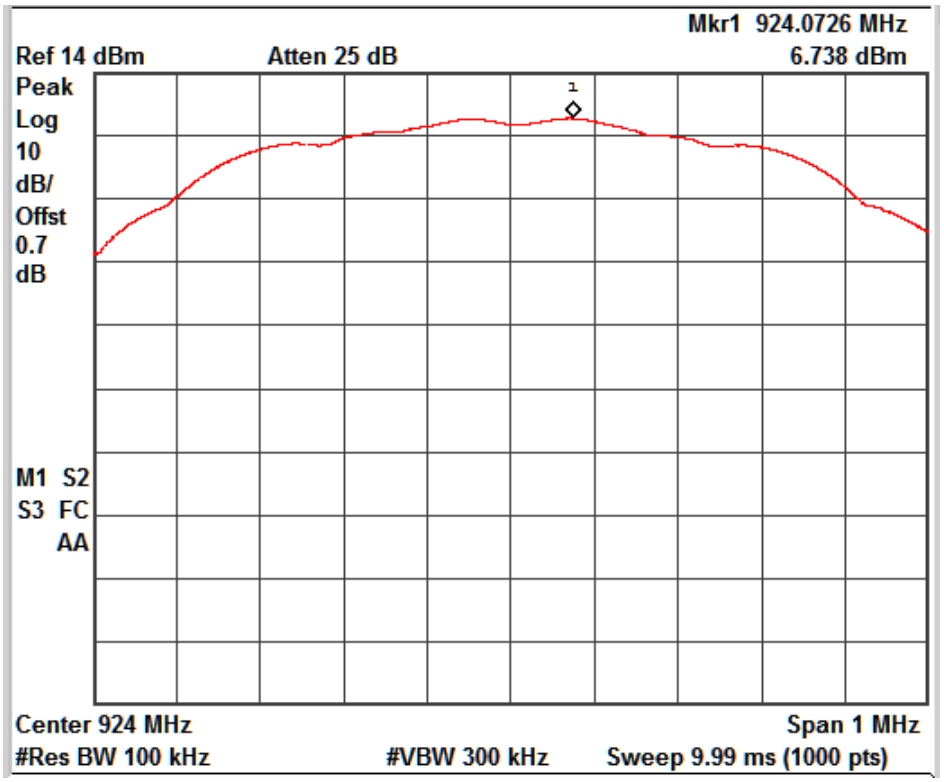
Frequency (MHz)	Total PSD (dBm)	Limit (dBm)	Margin (dB)
906	6.900	8.00	-1.100
914	6.849	8.00	-1.151
924	6.738	8.00	-1.262



Channel Frequency: 906 MHz



Channel Frequency: 914 MHz



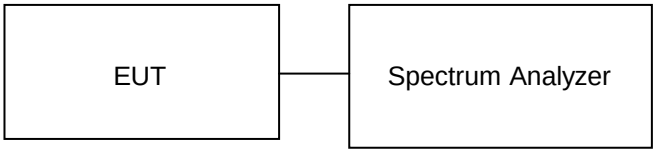
Channel Frequency: 924 MHz

6 dB Bandwidth **Section 15.247(a) (2)**

Result **Pass**

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

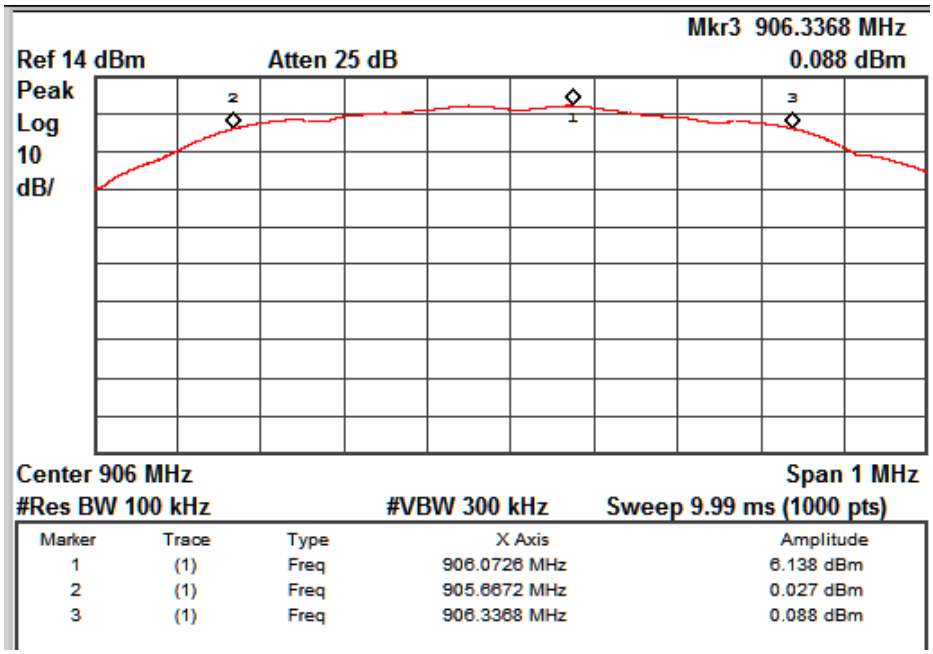
Test Method:



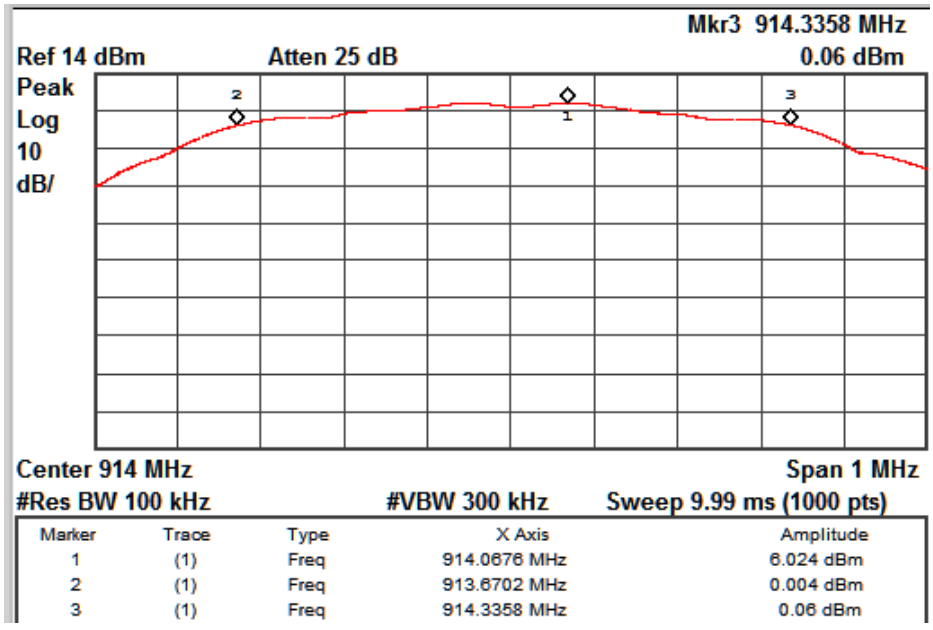
Test Result:

Cable Loss: 0.7dB (Included in the test results)

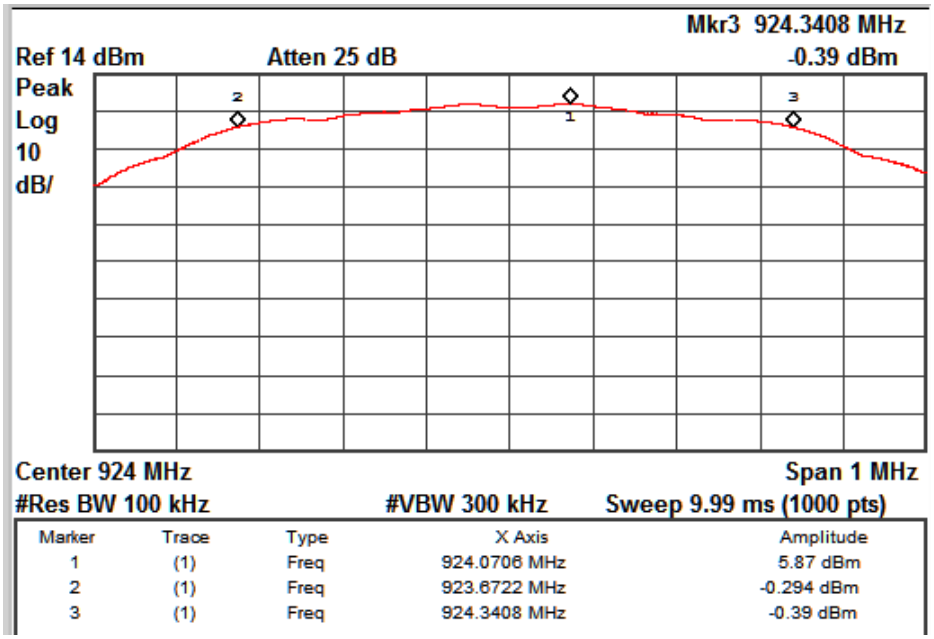
Frequency (MHz)	Lower Frequency (MHz)	Upper Frequency (MHz)	6 dB Bandwidth (kHz)	OBW (kHz)
906	905.67	906.34	671.6	870.90
914	913.67	914.34	665.6	868.69
924	923.67	924.34	668.6	860.12



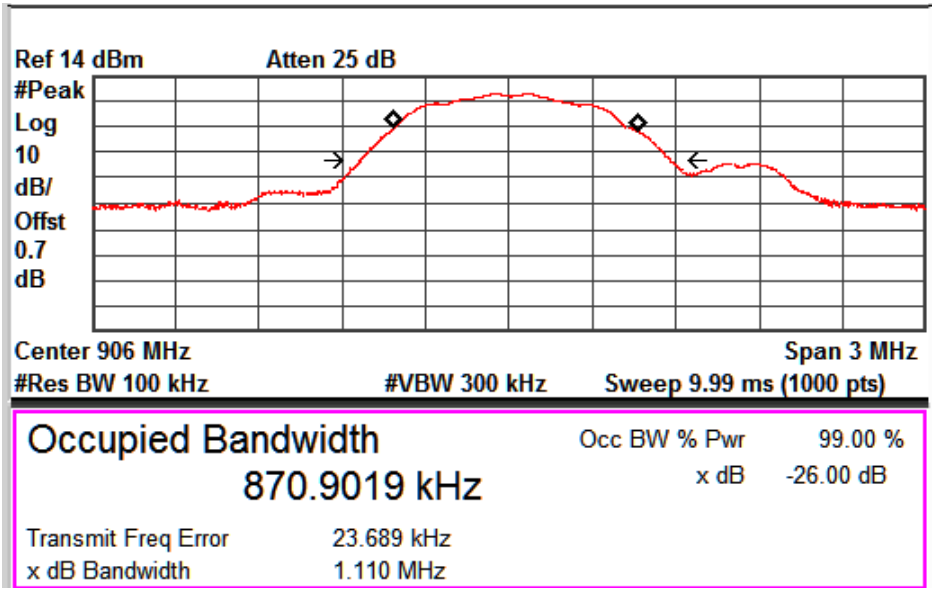
Channel frequency: 906 MHz



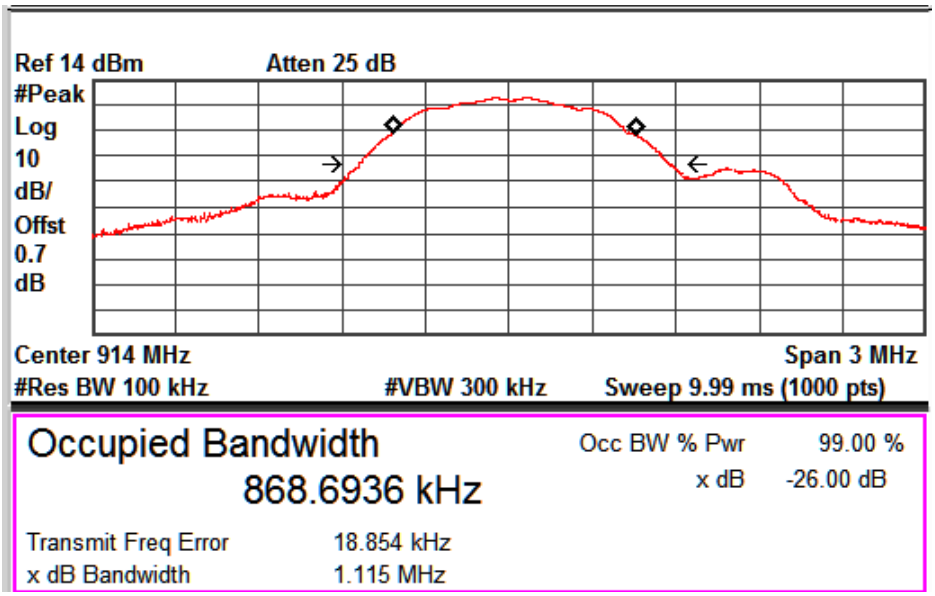
Channel frequency: 914 MHz



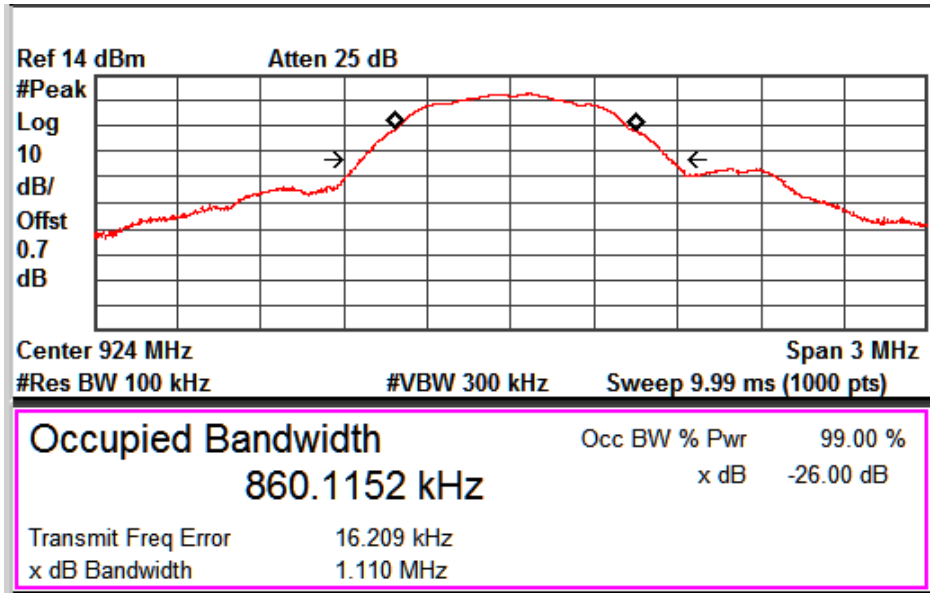
Channel frequency: 924 MHz



OBW Channel frequency: 906 MHz



OBW Channel frequency: 914 MHz



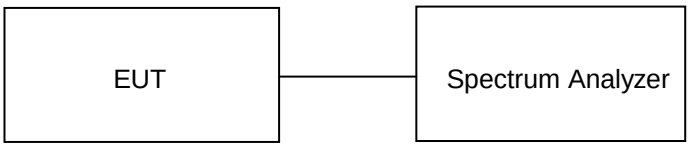
OBW Channel frequency: 924 MHz

Band-edge Compliance **Section 15.247(d)**

Result **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:

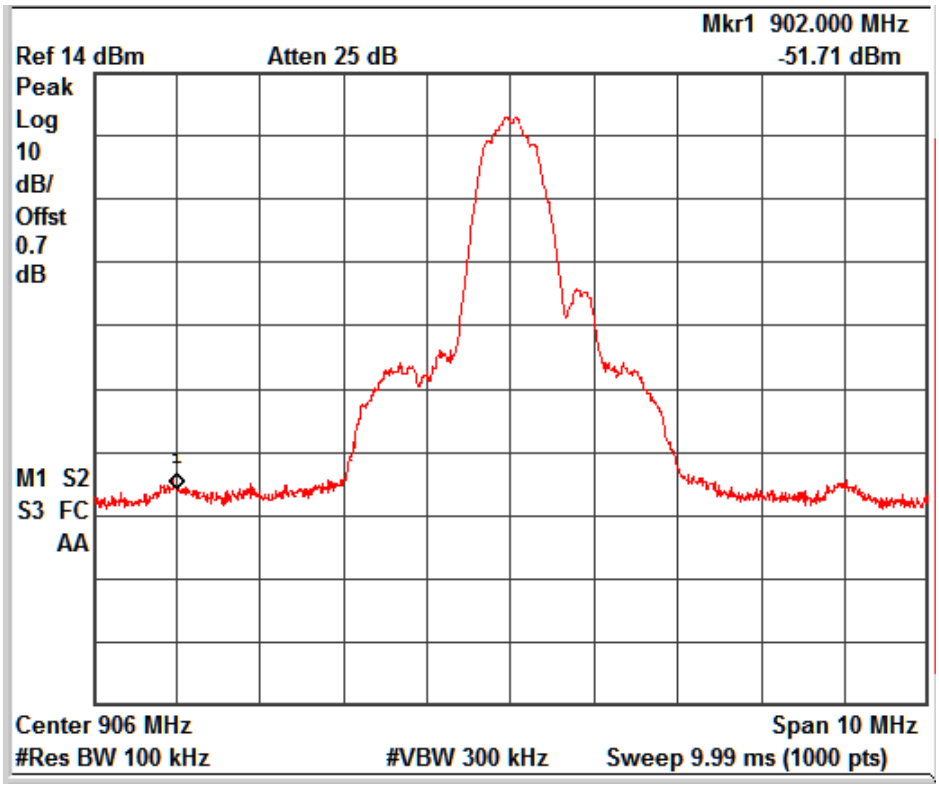


Test Result:

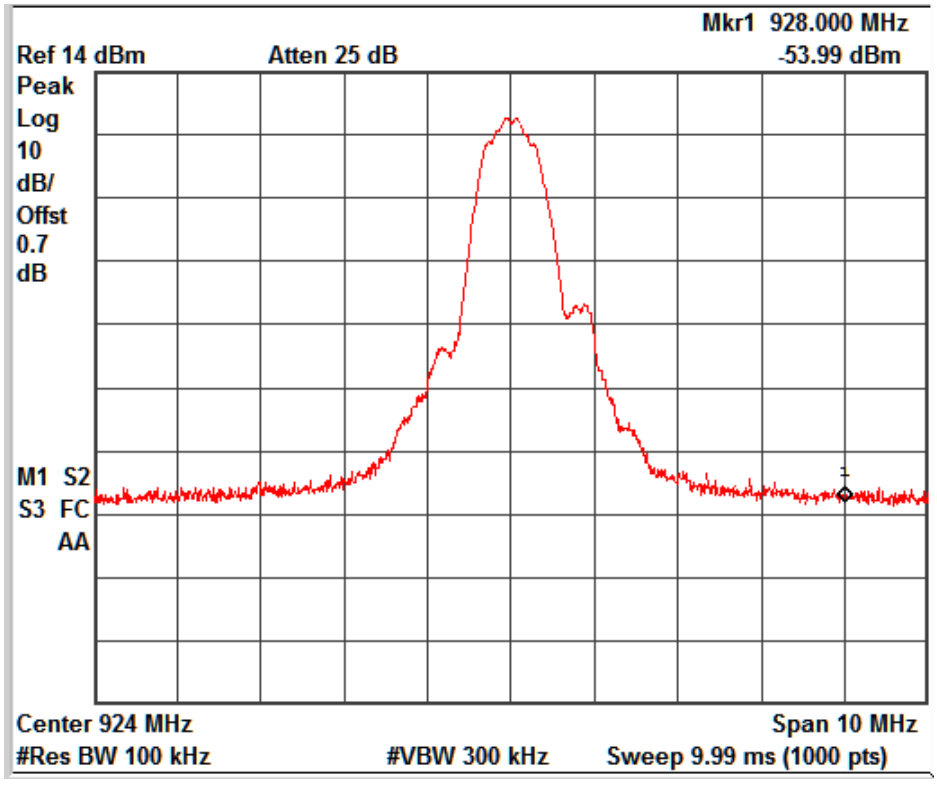
Cable Loss: 0.7dB (Included in the test results)

Channel Frequency (MHz)	Value at Band Edge				Limit (dB)
	Band Edge Frequency (MHz)	Measured PSD Level*	Band Edge Value (dBm)	Value (dBc)	
906	902	6.9	-51.71	-58.61	-20.00
924	928	6.738	-53.99	-60.73	-20.00

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

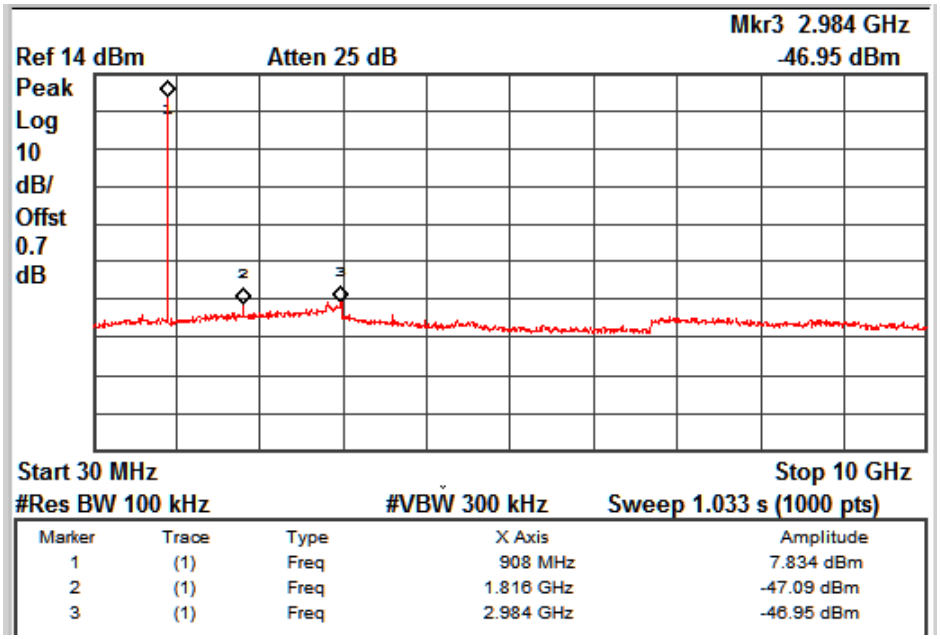


Channel frequency: 906 MHz

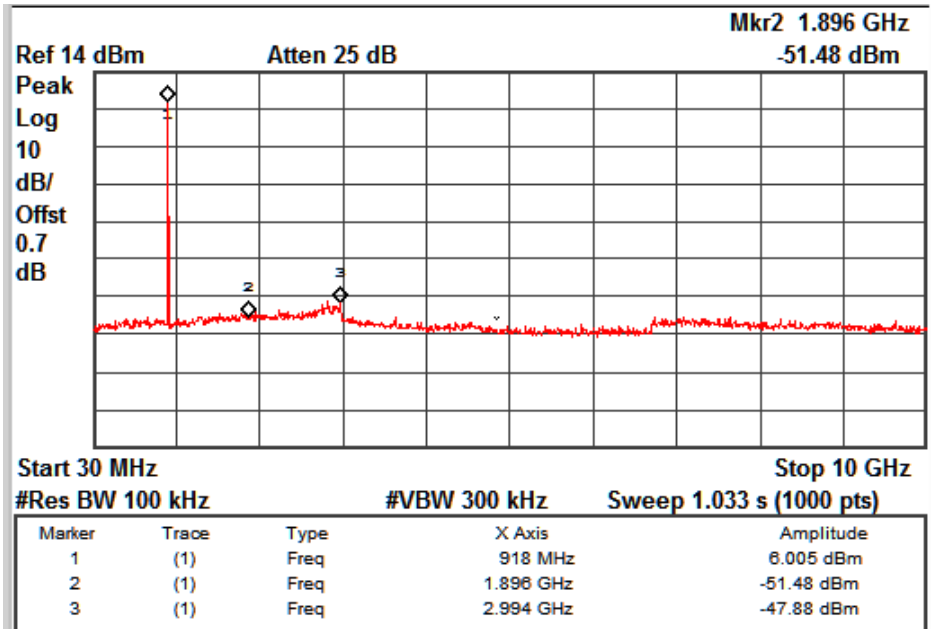


Channel frequency: 924 MHz

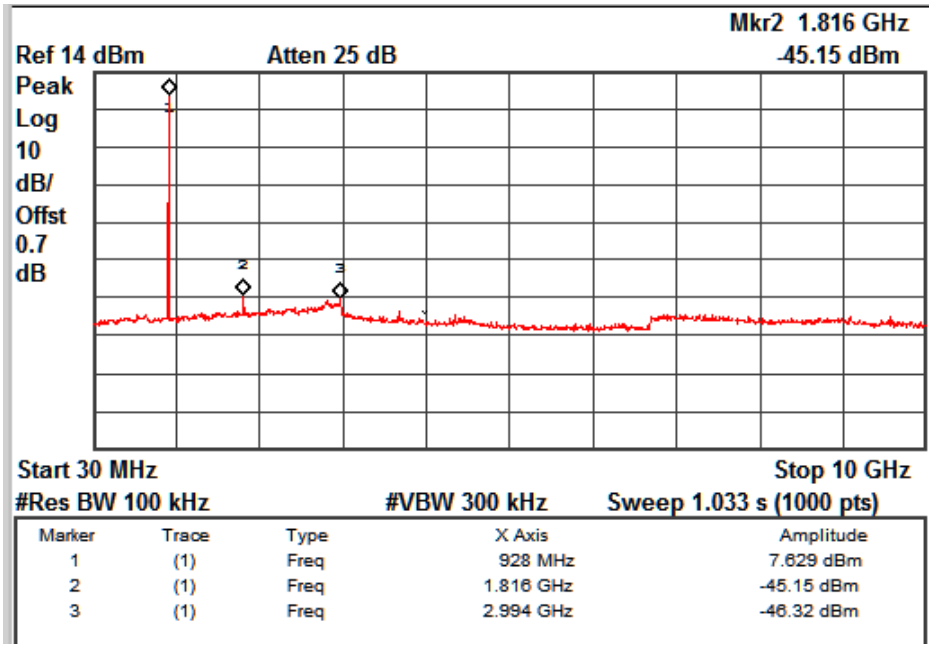
Conducted Spurious Emission



Channel frequency: 906 MHz



Channel frequency: 914 MHz



Channel frequency: 924 MHz

Spurious Radiated Emissions and

Restricted Bands of Operation **Section 15.209 and 15.205**

Result **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 (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 88, 50 – 53.80, 53.80 – 43.00 and 49.5dBμV/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:

Worst Case Test results for below 1GHz

Channel Frequency (MHz)	Polarization	Frequency (MHz)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
906	Vertical	249.75	29.84	46	-16.16
		906.03	85.92	*	-
	Horizontal	243.88	22.94	46	-23.06
		906.03	81.42	*	-
914	Vertical	244.19	33.03	46	-12.97
		914.05	85.4	*	-
	Horizontal	245.04	28.93	46	-17.07
		914.05	82.64	*	-
924	Vertical	246.21	31.53	46	-14.47
		924.04	85.87	*	-
	Horizontal	246.31	26.00	46	-20.00
		924.04	83.79	*	-

*** - -> Fundamental Frequency**

Above 1GHz

Channel Frequency (MHz)	Polarization	Frequency (MHz)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
906	Vertical	1811.9(Pk)	38.31	74	-35.69
		1811.9(Av)	28.55	54	-25.45
		2718.1(Pk)	41.07	74	-32.93
		2718.1(Av)	26.92	54	-27.08
		3624.1(Pk)	50.37	74	-23.63
		3624.1(Av)	43.51	54	-10.49
	Horizontal	1812(Pk)	40.25	74	-33.75
		1812(Av)	31.3	54	-22.7
		2718.2(Pk)	40.93	74	-33.07
		2718.2(Av)	29.73	54	-24.27
		3624.2(Pk)	51.37	74	-22.63
		3624.2(Av)	46.15	54	-7.85
914	Vertical	1828.1(Pk)	37.14	74	-36.86
		1828.1(Av)	27.07	54	-26.93
		2742(Pk)	39.18	74	-34.82
		2742(Av)	27.74	54	-26.26
		3656.1(Pk)	51.23	74	-22.77
		3656.1(Av)	44.26	54	-9.74
	Horizontal	1828.1(Pk)	40.24	74	-33.76
		1828.1(Av)	33.94	54	-20.06
		2742(Pk)	44.36	74	-29.64
		2742(Av)	34.6	54	-19.4
		3656.1(Pk)	56.11	74	-17.89
		3656.1(Av)	51.61	54	-2.39
924	Vertical	1848.1(Pk)	36.84	74	-37.16
		1848.1(Av)	26.53	54	-27.47
		2772(Pk)	33.88	74	-40.12
		2772(Av)	27.86	54	-26.14
		3696(Pk)	50.18	74	-23.82
		3696(Av)	43.16	54	-10.84
	Horizontal	1848(Pk)	39.89	74	-34.11
		1848(Av)	33.78	54	-20.22
		2772(Pk)	45.22	74	-28.78
		2772(Av)	36.24	54	-17.76
		3696(Pk)	55.44	74	-18.56
		3696(Av)	50.59	54	-3.41

Conducted Emission Test on A.C. Power Line **Section 15.207**

Result **Pass**

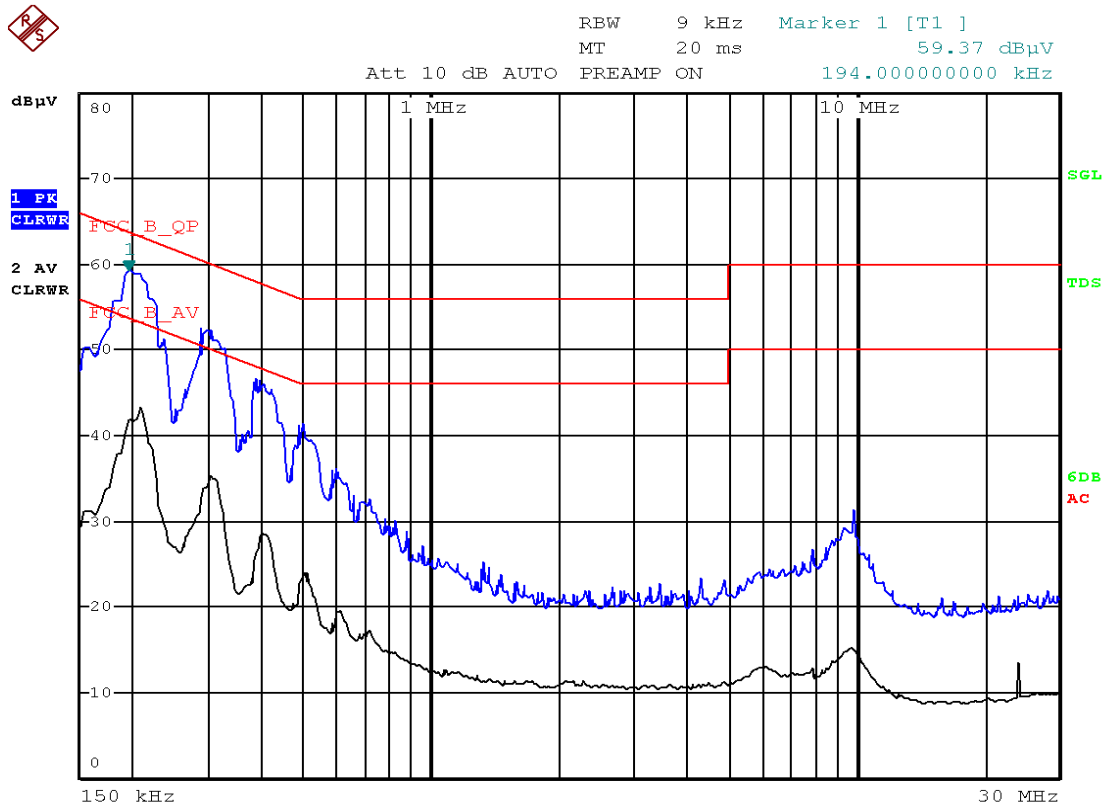
Test Specification	:	FCC Part 15 Section 15.207
Test Method	:	ANSI C63.4-2003
Testing Location	:	Screened room
Measurement Bandwidth	:	9kHz
Frequency Range	:	150kHz – 30MHz
Supply Voltage	:	120VAC,60Hz

Limit 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

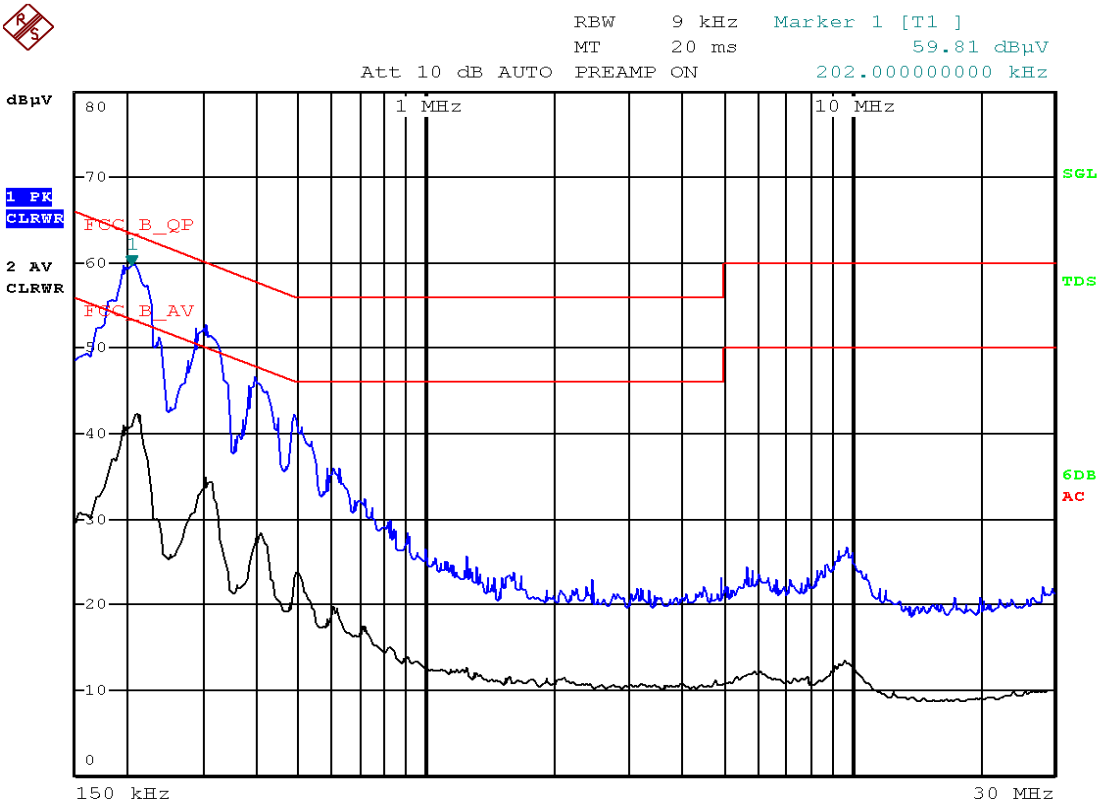
* Decreases with the logarithm of the frequency

Test Result:



EDIT PEAK LIST (Final Measurement Results)			
Trace1:	FCC_B_QP		
Trace2:	FCC_B_AV		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
1 Quasi Peak	194 kHz	57.11 L1	-6.74
2 Average	206 kHz	43.31 L1	-10.05
1 Quasi Peak	286 kHz	49.55 L1	-11.08
2 Average	302 kHz	35.69 L1	-14.49
1 Quasi Peak	386 kHz	42.71 L1	-15.43
1 Quasi Peak	498 kHz	37.70 L1	-18.32
2 Average	398 kHz	28.35 L1	-19.54
2 Average	502 kHz	24.04 L1	-21.95
2 Average	610 kHz	19.49 L1	-26.50
1 Quasi Peak	9.85 MHz	21.86 L1	-38.13

Mode: Line



EDIT PEAK LIST (Final Measurement Results)

Trace1:	FCC_B_QP
Trace2:	FCC_B_AV
Trace3:	---

TRACE	FREQUENCY	LEVEL dBµV		DELTA LIMIT dB
1 Quasi Peak	202 kHz	56.86	N	-6.65
1 Quasi Peak	302 kHz	49.92	N	-10.25
2 Average	206 kHz	41.96	N	-11.40
1 Quasi Peak	394 kHz	43.59	N	-14.38
2 Average	302 kHz	34.95	N	-15.23
1 Quasi Peak	490 kHz	38.08	N	-18.08
2 Average	406 kHz	28.01	N	-19.71
2 Average	498 kHz	23.41	N	-22.62
2 Average	618 kHz	18.89	N	-27.10
1 Quasi Peak	9.742 MHz	19.19	N	-40.80

Mode: Neutral