Produkte
Products

Prüfbericht - Nr.: *Test Report No.:*	**19660079 001**	**Seite 1 von 29** *Page 1 of 29*
Auftraggeber: *Client:*	**ATMEL NORWAY AS** **VESTRE ROSTEN 79** **7075 TILLER** **TRONDHEIM** **NORWAY - 7075**	
Gegenstand der Prüfung: *Test item:*	**ATZB-RF-212B-0-U Sub GHz Transceiver ZigBit with UFL Connector**	
Bezeichnung: *Identification:*	**ATZB-RF-212B-0-U**	**Serien-Nr.:** *Serial No.* **Engineering Sample**
Wareneingangs-Nr.: *Receipt No.:*	**1803032233**	**Eingangsdatum:** *Date of receipt:* **28.02.2014**
Prüfort: *Testing location:*	**Refer Page 4 of 29 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 **FCC Registration No.: 176555; IC Assigned Code: 3466E**	

geprüft / *tested by:*			**kontrolliert /** *reviewed by:*		
19.03.2014	Saibaba Siddapur Test Engineer		25.03.2014	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 : VW4A092201**

Abkürzungen:	***P(ass)***	***=***	***entspricht Prüfgrundlage***	***Abbreviations:***	***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

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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) 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 RF212B is a Zigbit 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 Type	BPSK
Transmitted Power	08.50dBm
Data Rate	40 kbps
Antenna Type	Refer page 6 of 29
Number of antenna	Refer page 6 of 29
Antenna Gain	Refer page 6 of 29
Supply Voltage	1.8VDC – 3.6VDC
Dimensions	30mm X 20mm
Environmental	85C to -25C

Test Conditions:

Voltage: 5V 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 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 2.4 GHz 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

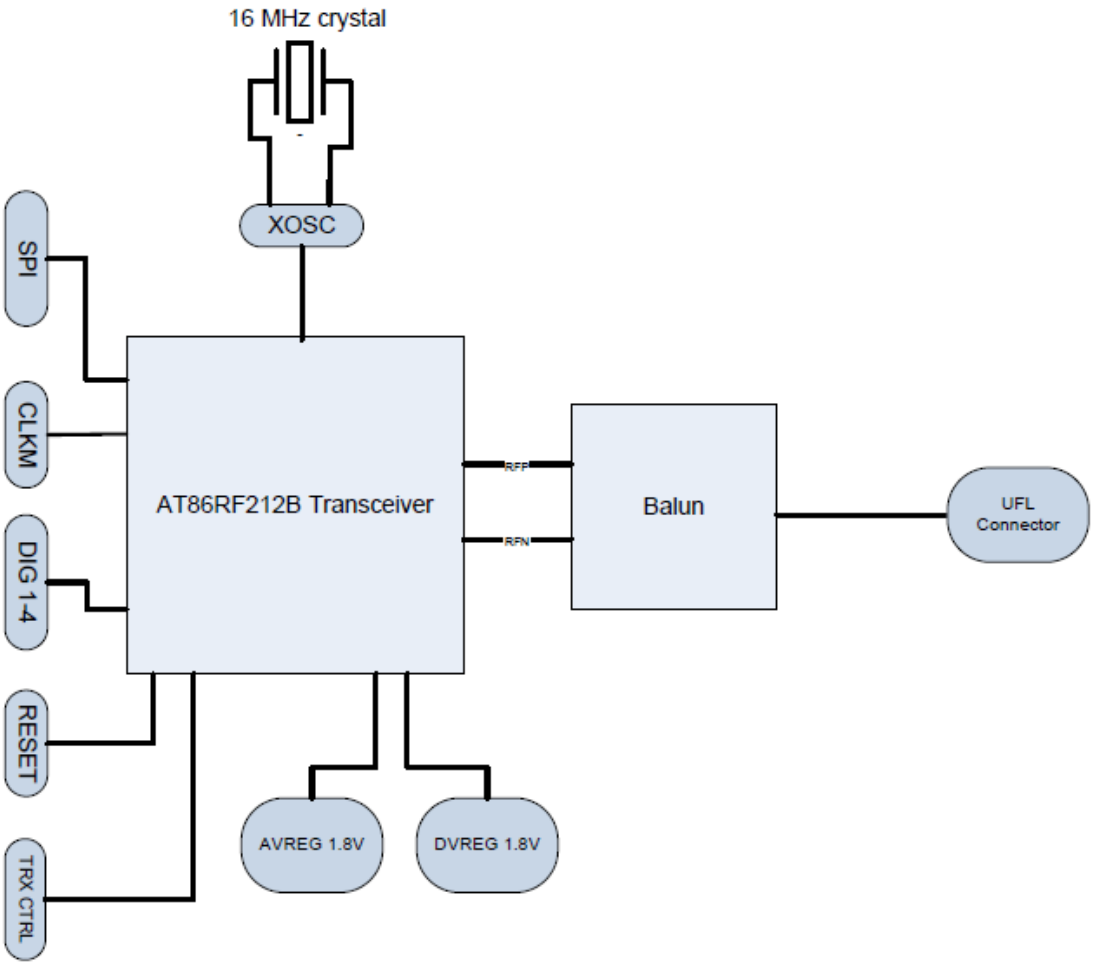
Antenna Details

Make	Model/Part #	Antenna Gain (dBi)	Type of Antenna
Pulse Electronics Corporation	W1063	3dBi	External Antenna
Molex	105262-0002	1.3dBi	UFL-cable integrated with Antenna

Transmitter Power Setting used for testing for the below channels

Channel	Power Setting in dBm
906MHz	10dBm
914MHz	10dBm
924MHz	10dBm

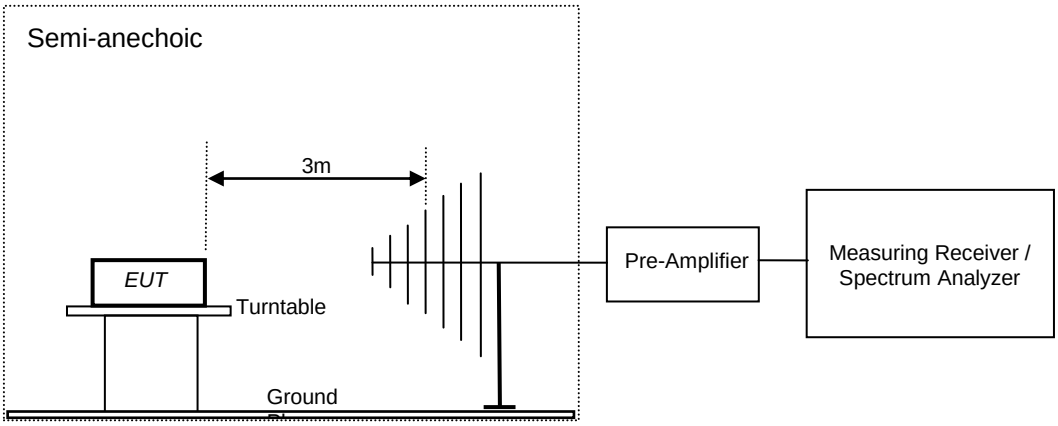
Block Diagram



Test Methodology

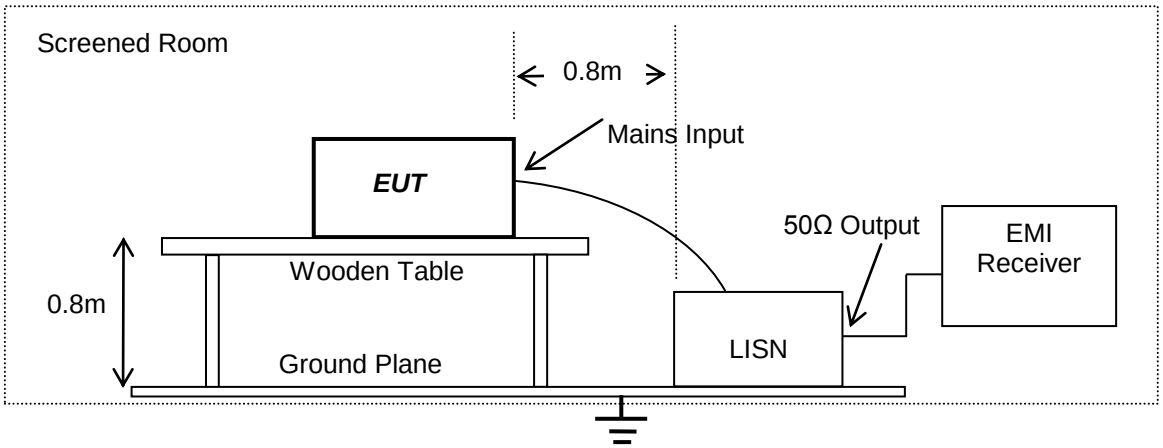
Radiated Emission Test

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.



Conducted Emission Test on A.C. mains line

The equipment under test (EUT) was placed on a wooden table 80cm above the ground plane, the LISN was place 80cm away from the EUT. The test was performed in accordance with ANSI C63.4: 2003, with the following: an initial measurement was performed in peak and average detection mode on the live and neutral lines. The pre-scan was performed by peak detection on both live and neutral conductors. Any emissions recorded within 20dB of the relevant limit line were re-measured using quasi-peak and average detections, the 6 worst cases was recorded in the table of results.

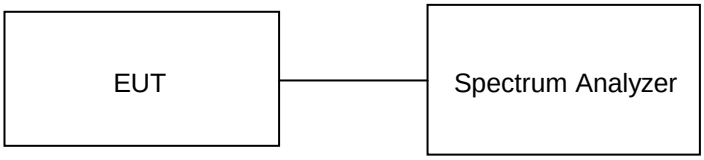


Test Results

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).

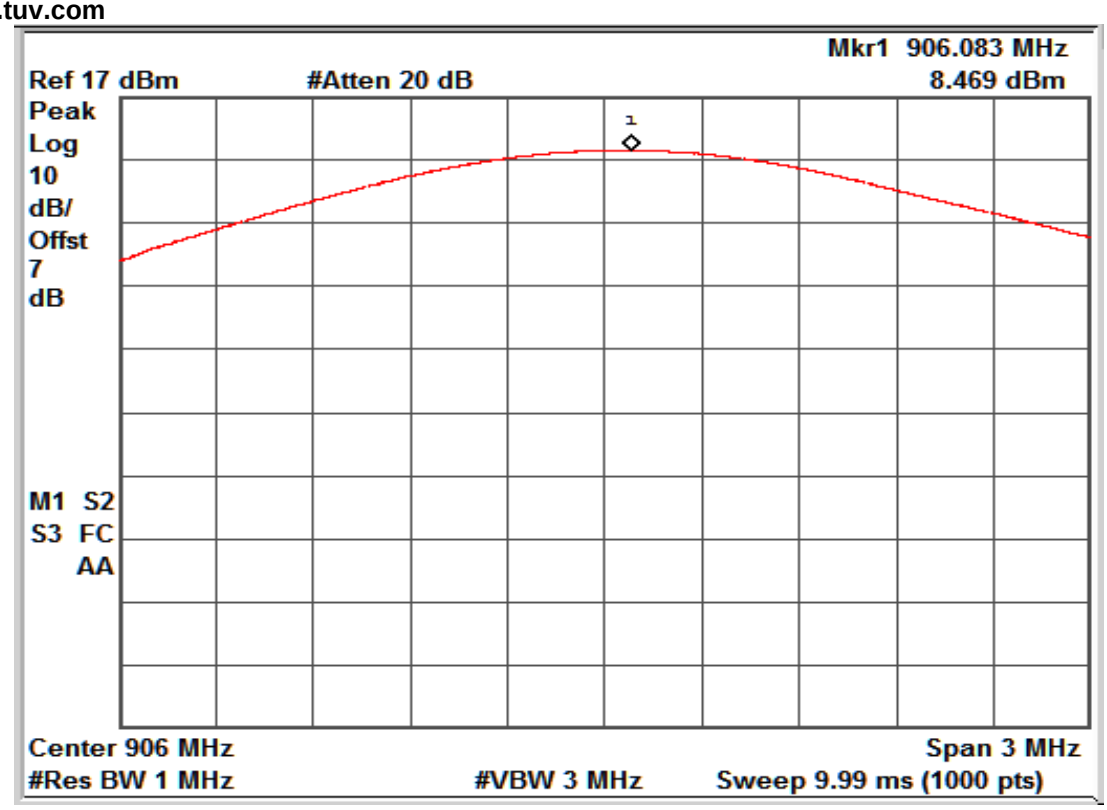
Test Method:



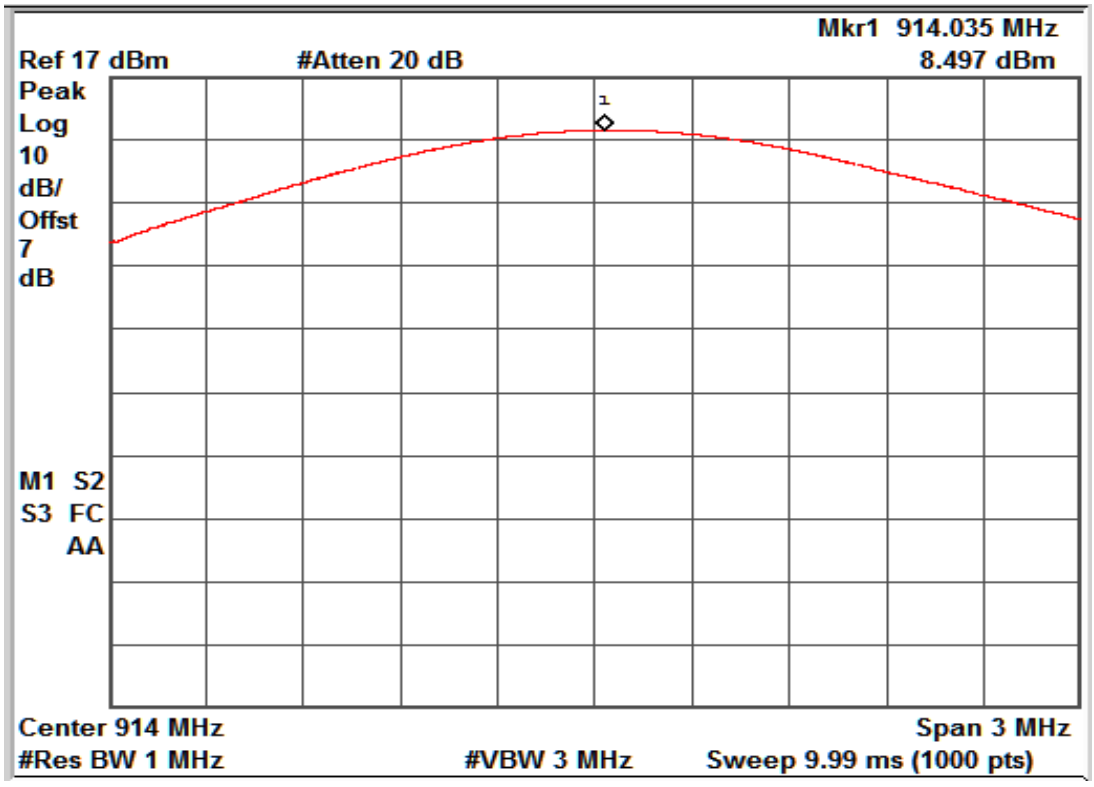
Note: Attenuator/cable (7dB) offset already part of measurement offset in spectrum analyzer.

Test Result:

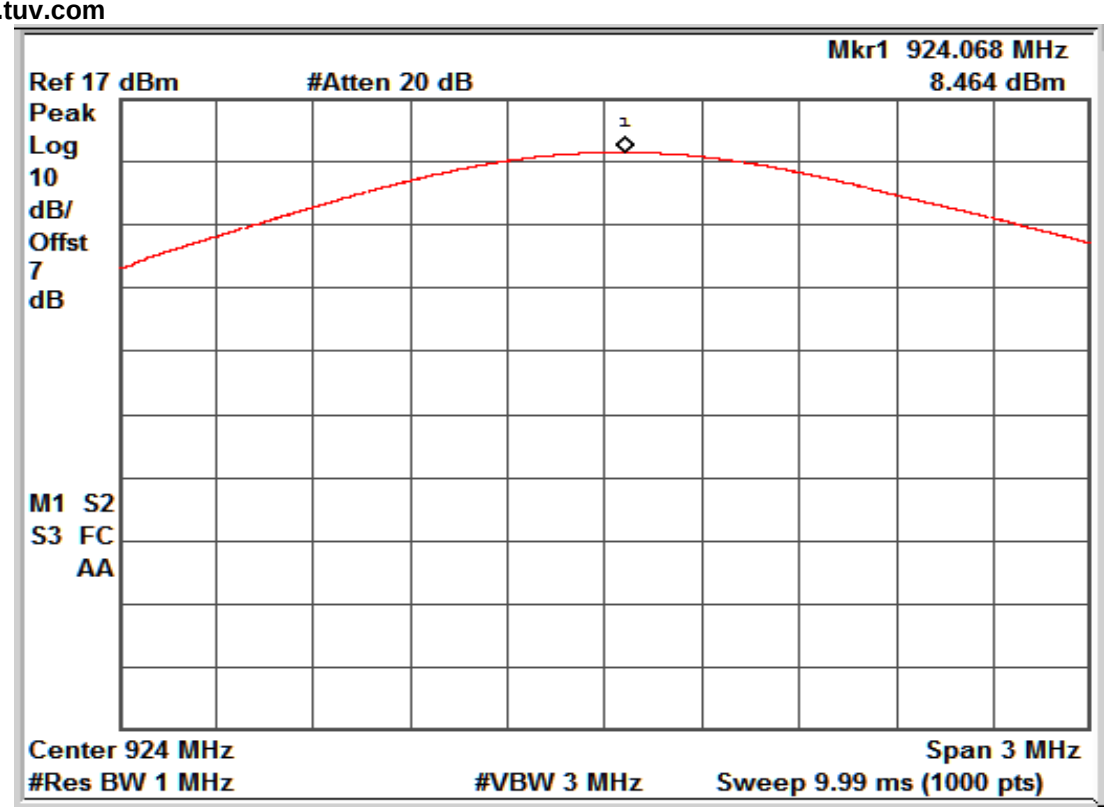
Frequency (MHz)	Total Output power (dBm)	Limit (dBm)	Margin (dB)
906	8.47	30.00	-21.53
914	8.50	30.00	-21.50
924	8.46	30.00	-21.54



Channel Frequency: 906 MHz



Channel Frequency: 914 MHz

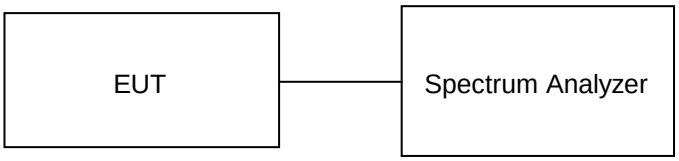


Channel Frequency: 924 MHz

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.

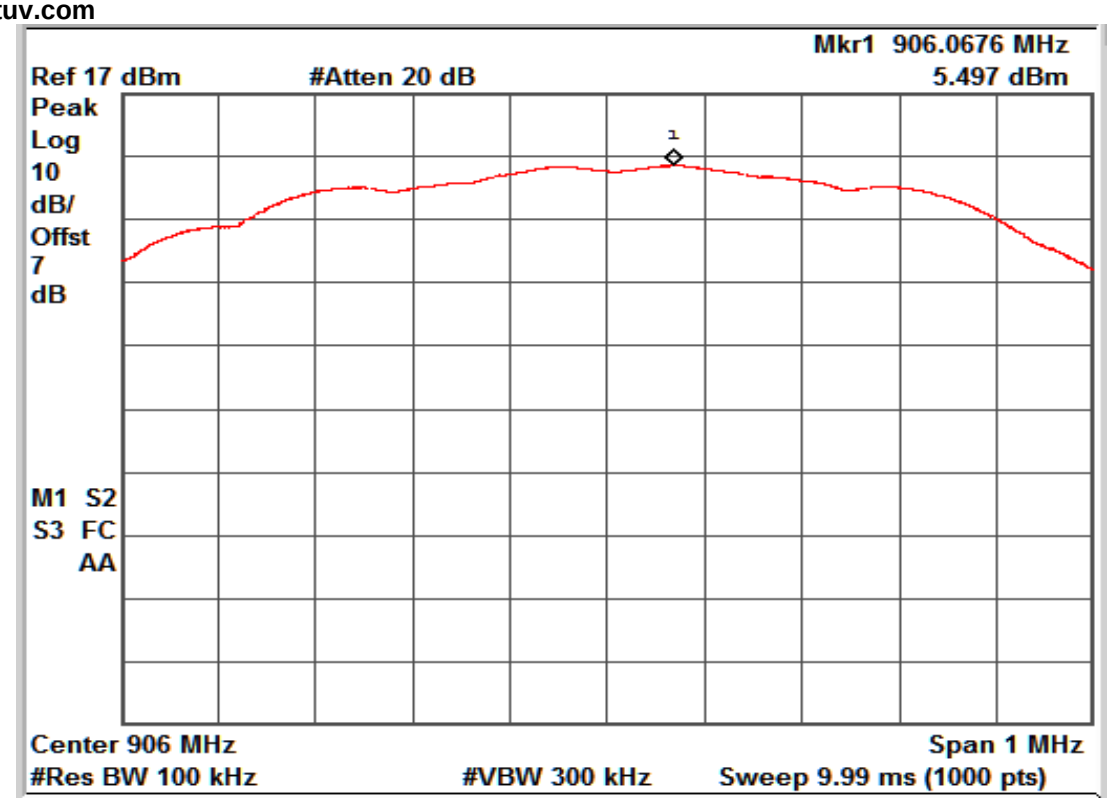
Test Method:



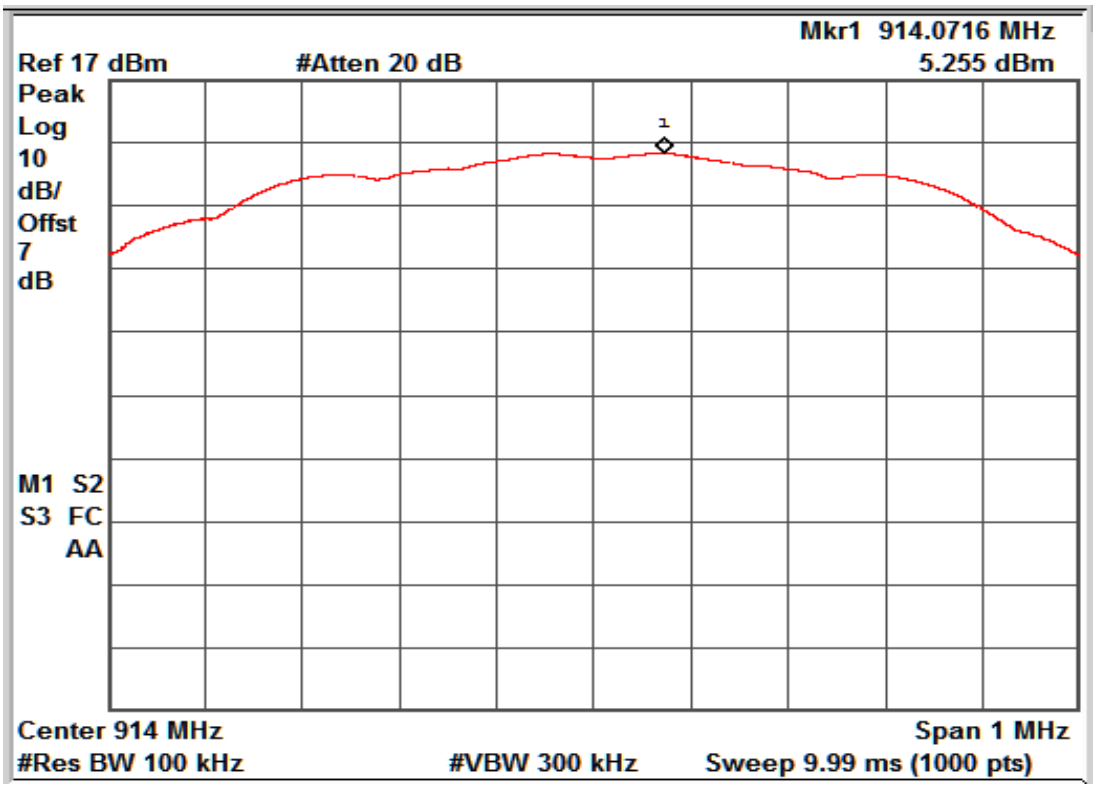
Note: Attenuator/cable (7dB) offset already part of measurement offset in spectrum analyzer.

Test Result:

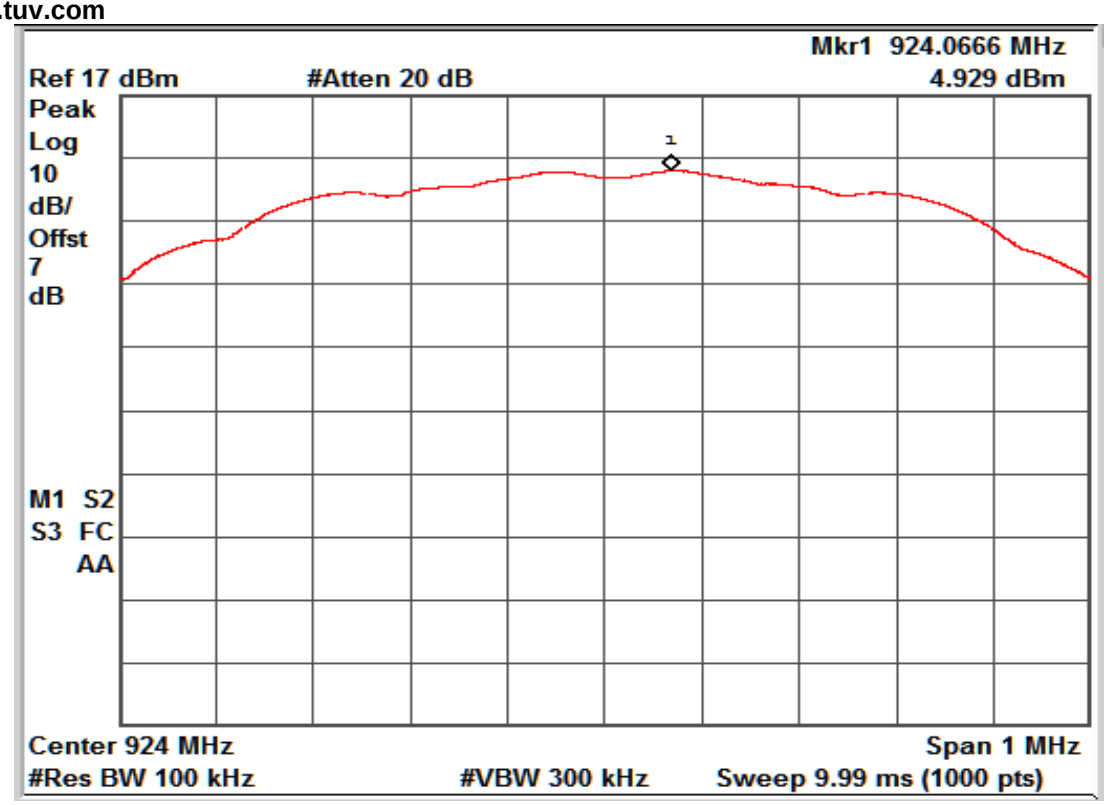
Frequency (MHz)	Total PSD (dBm)	Limit (dBm)	Margin (dB)
906	5.50	8.00	-2.50
914	5.26	8.00	-2.75
924	4.93	8.00	-3.07



Channel Frequency: 906 MHz



Channel Frequency: 914 MHz

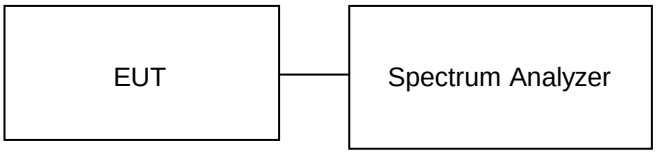


Channel Frequency: 924 MHz

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.

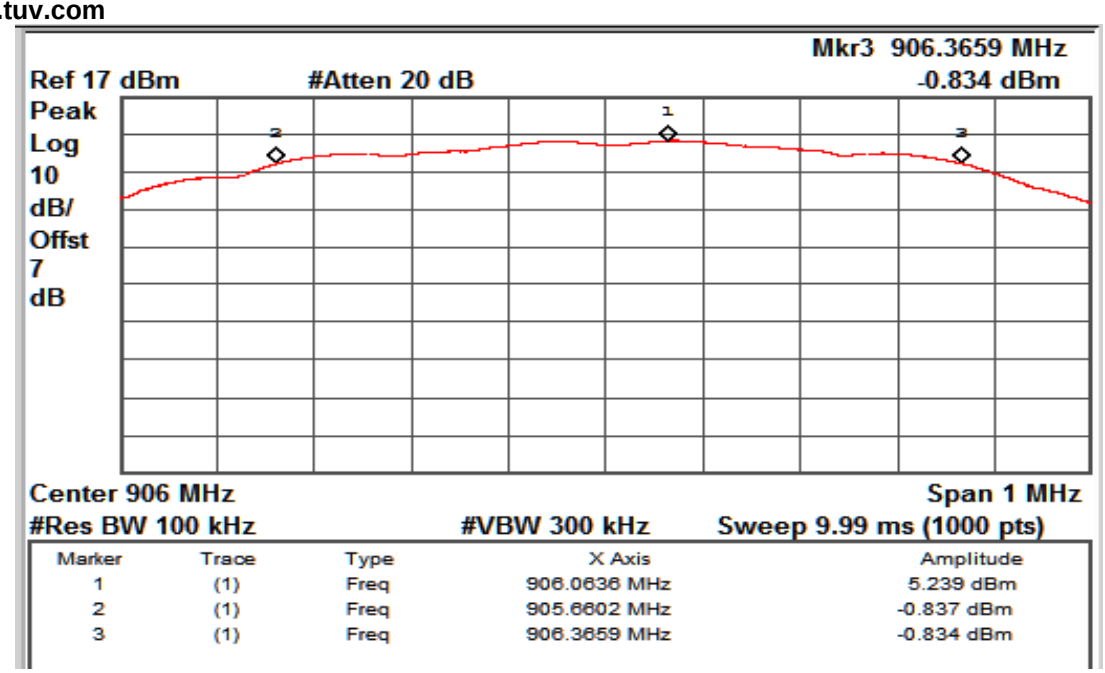
Test Method:



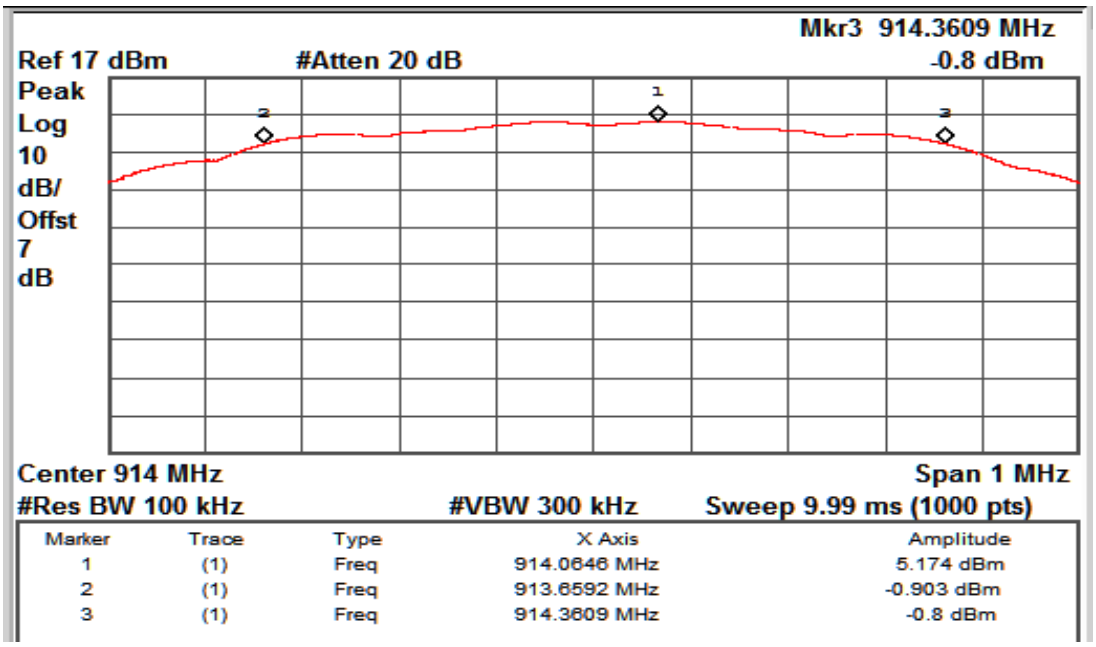
Note: Attenuator/cable (7dB) offset already part of measurement offset in spectrum analyzer.

Test Result:

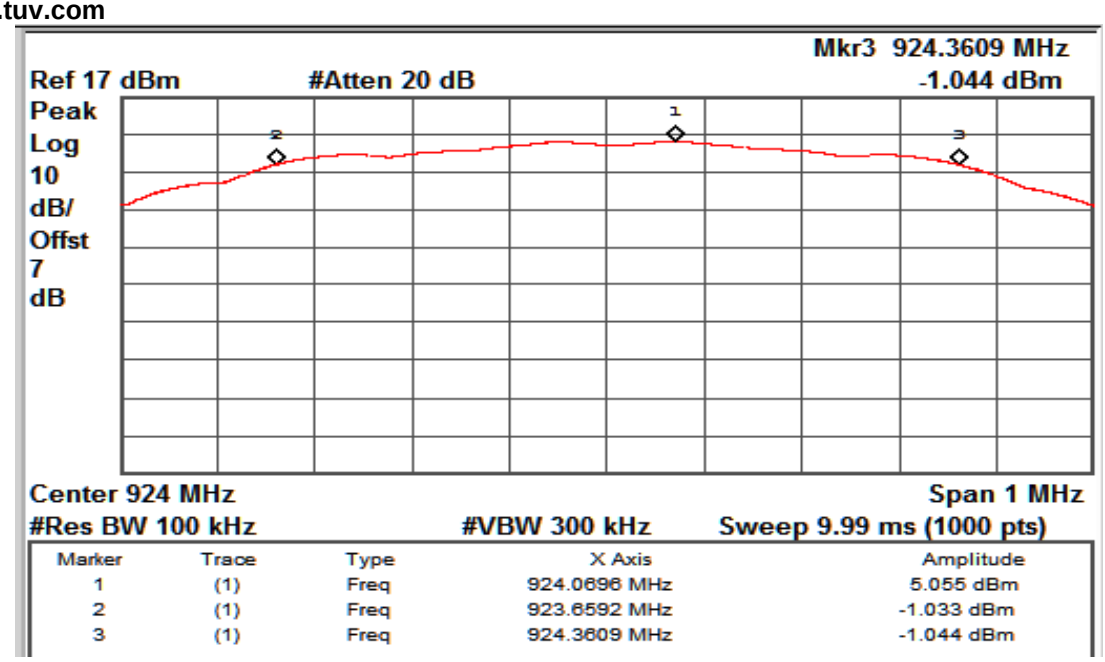
Frequency (MHz)	Lower Frequency (MHz)	Upper Frequency (MHz)	6 dB Bandwidth (MHz)	OBW (MHz)
906	906.37	905.66	0.71	1.0277
914	914.36	913.66	0.70	0.9988
924	924.36	923.66	0.70	0.9669



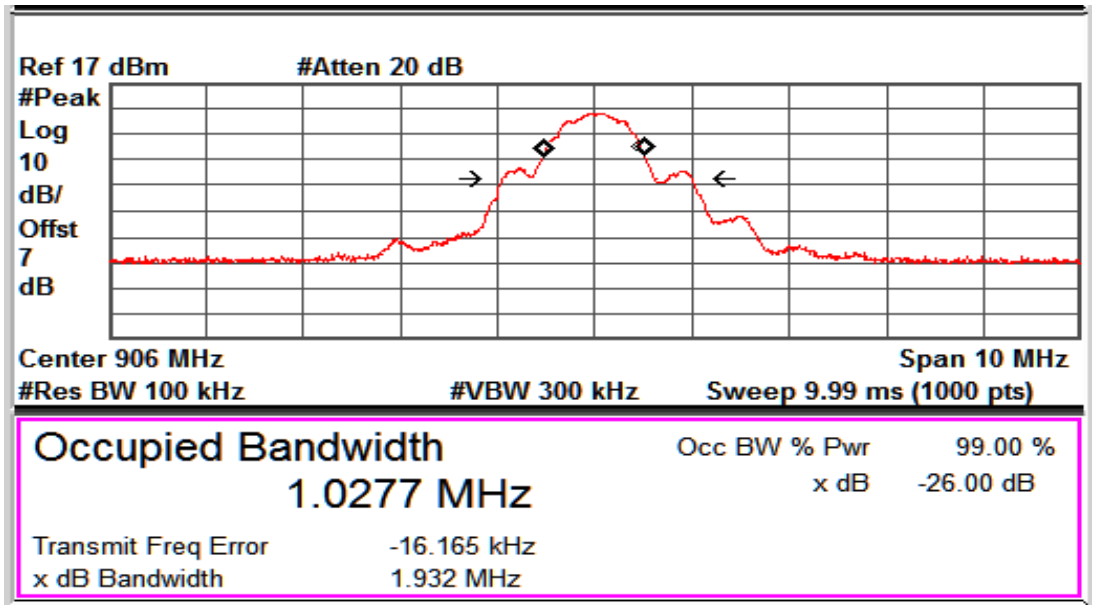
Channel frequency: 906 MHz



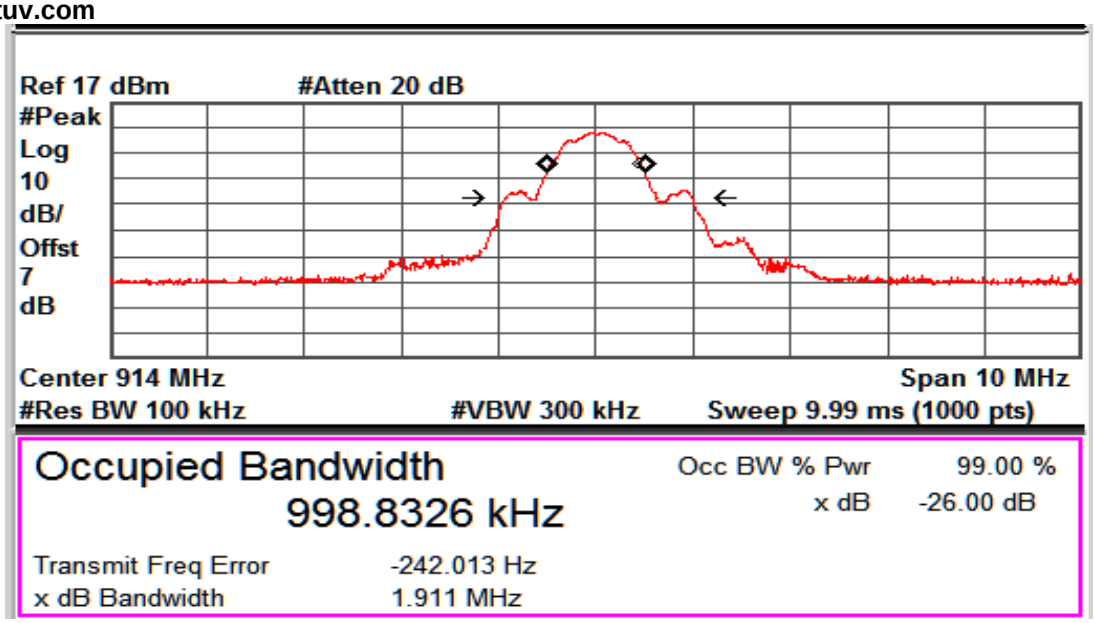
Channel frequency: 914 MHz



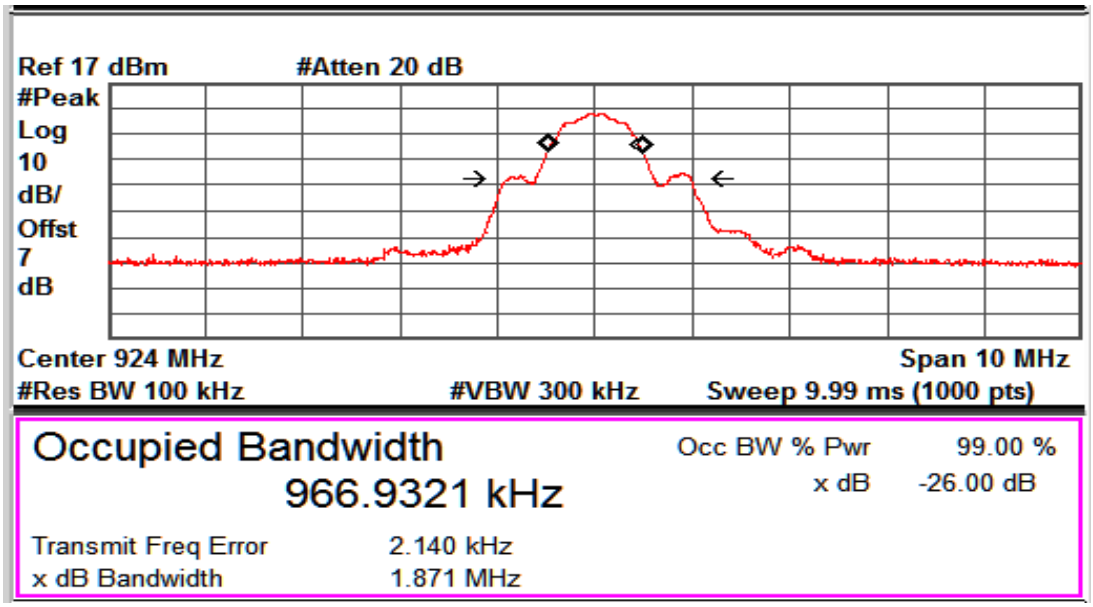
Channel frequency: 924 MHz



OBW Channel frequency: 906 MHz



OBW Channel frequency: 914 MHz

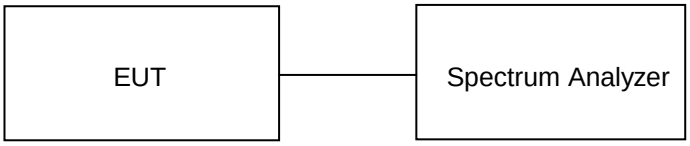


OBW Channel frequency: 924 MHz

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:

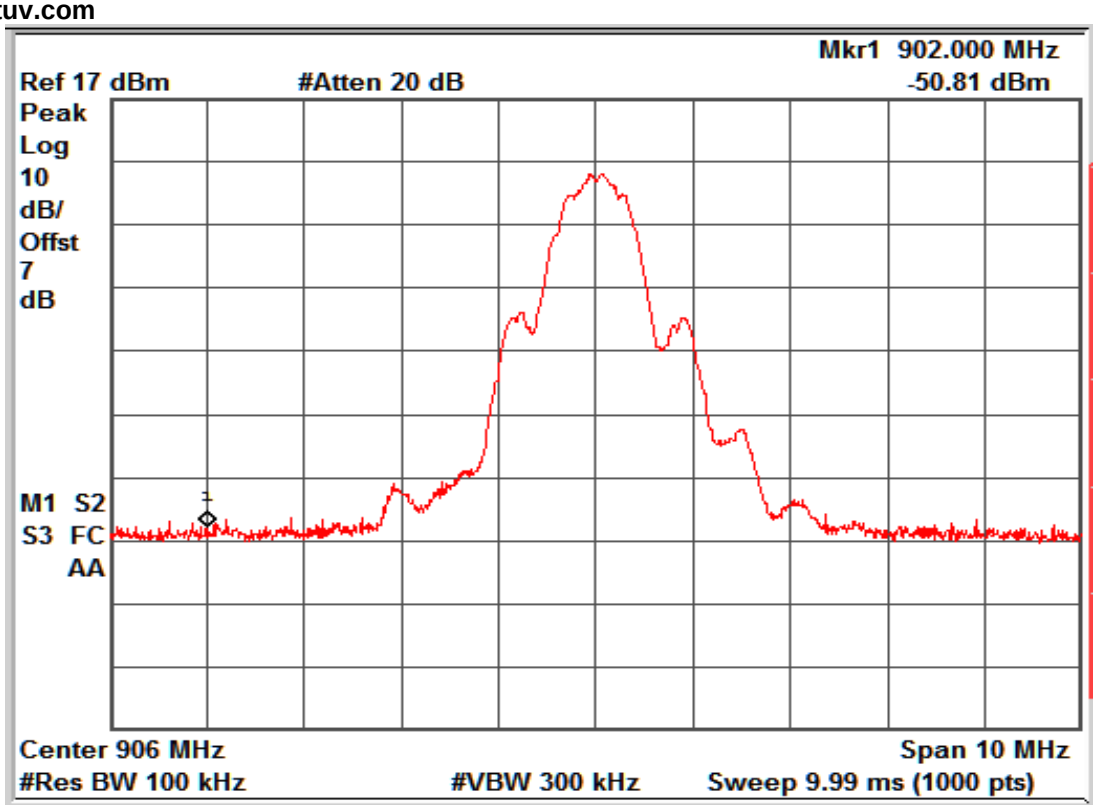


Note: Attenuator/cable (7dB) offset already part of measurement offset in spectrum analyzer.

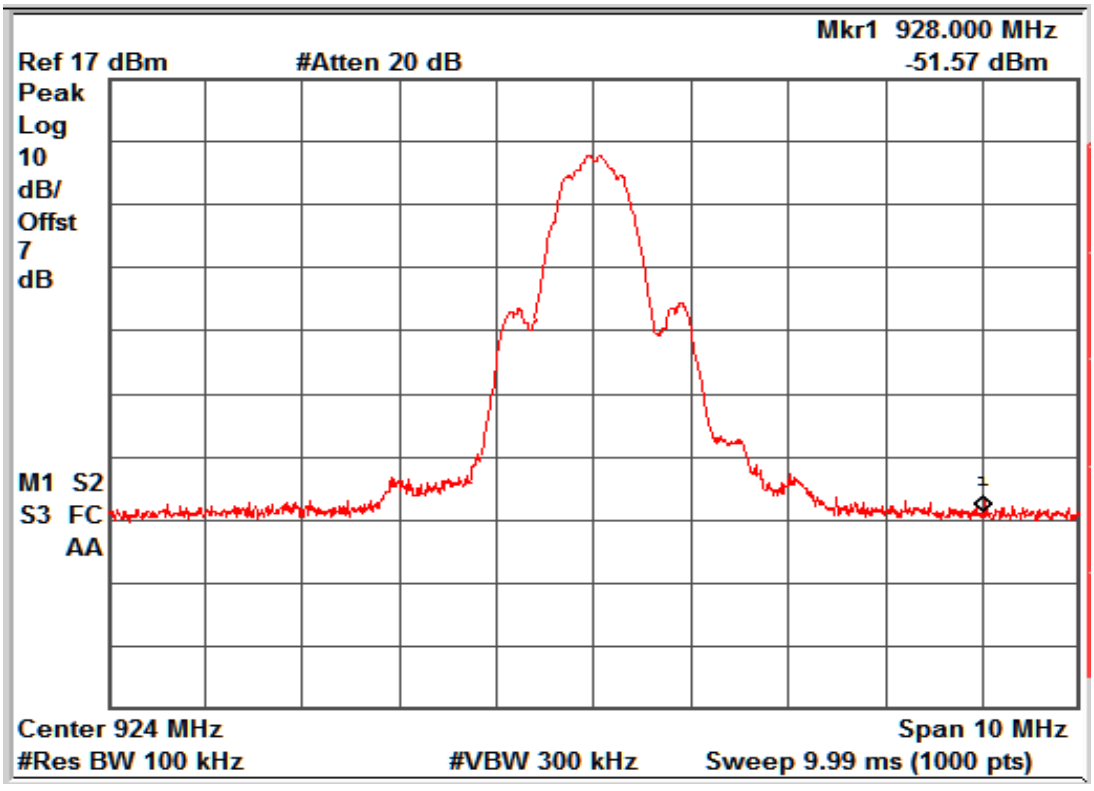
Test Result:

Channel Frequency (MHz)	Value at Band Edge				Limit (dB)
	Band Edge Frequency (MHz)	Measured PSD Level*	Band Edge Value (dBm)	Value (dBc)	
906	902	5.50	-50.81	-56.31	-20.00
924	928	4.93	-51.57	-56.50	-20.00

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

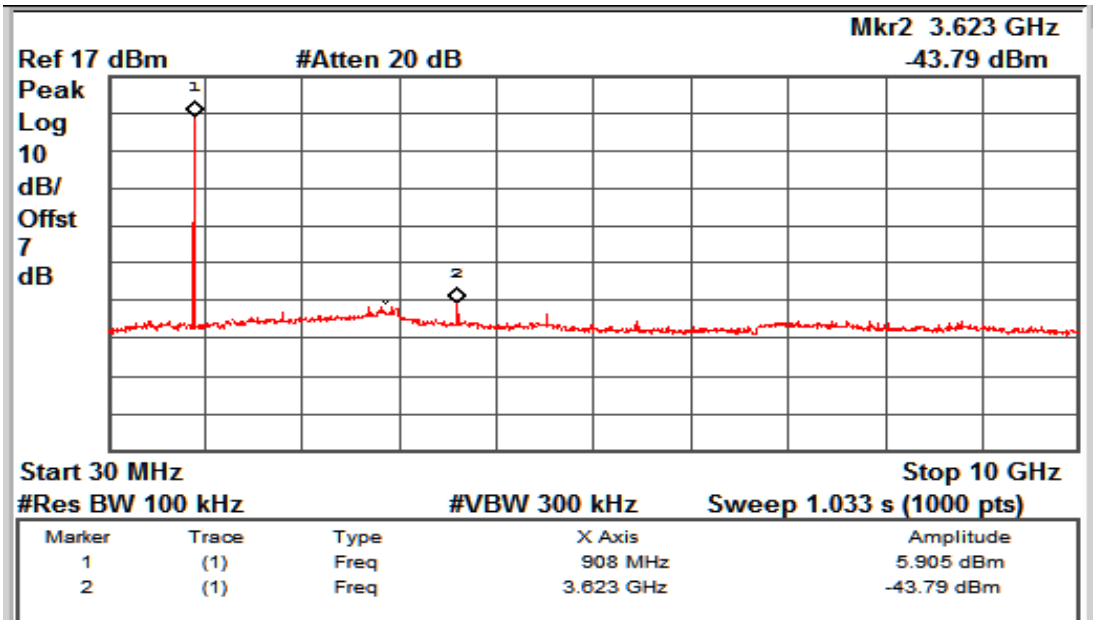


Channel frequency: 906 MHz

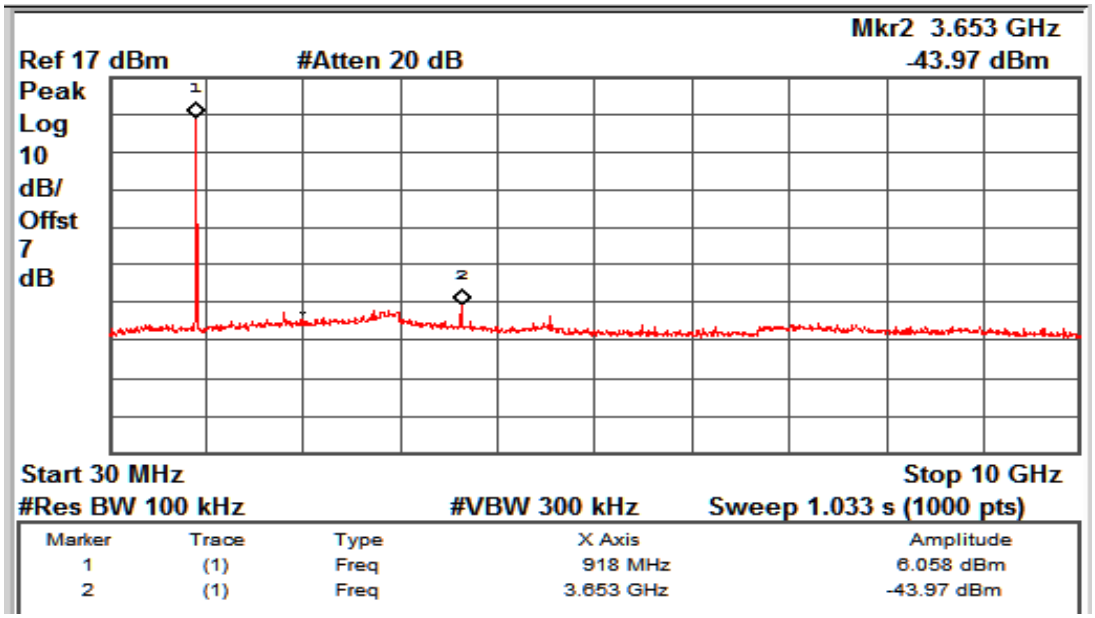


Channel frequency: 924 MHz

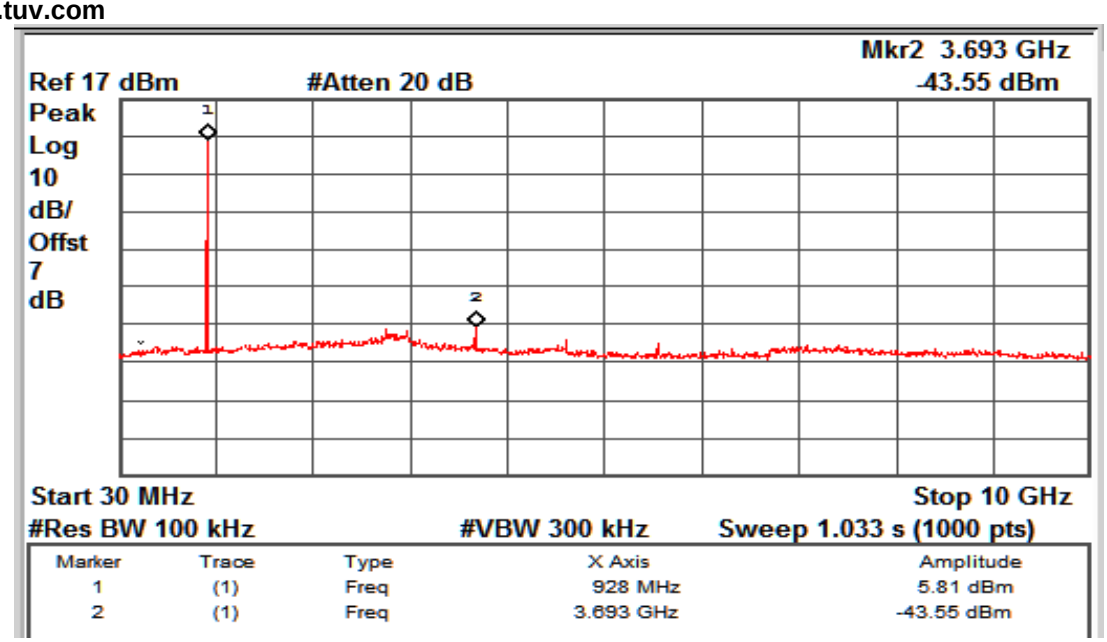
Conducted Spurious Emission



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:

Antenna Type: External Antenna

Channel	polarization	Frequency (MHz)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Low (906MHz)	Vertical	906.10	101.06	*	-
		1812(Pk)	47.55	74	-26.45
		1812(Av)	43.25	54	-10.75
		2718(Pk)	46.92	74	-27.08
		2718(Av)	38.54	54	-15.46
		3624(Pk)	48.83	74	-25.17
		3624(Av)	42.12	54	-11.88
		4529.8(Pk)	53.18	74	-20.82
		4530(Av)	43.94	54	-10.06
		5436(Pk)	53.86	74	-20.14
		5436(Av)	45.74	54	-08.26
	Horizontal	906.18	94.50	*	-
		1812(Pk)	49.18	74	-24.82
		1812(Av)	45.08	54	-08.92
		2718(Pk)	46.51	74	-27.49
		2718(Av)	38.59	54	-15.41
		3624(Pk)	50.77	74	-23.23
		3624(Av)	46.06	54	-07.94
		4530(Pk)	51.78	74	-22.22
		4530(Av)	43.09	54	-10.91
		5436(Pk)	52.54	74	-21.46
		5436(Av)	44.26	54	-09.74
Mid (914MHz)	Vertical	914.04	101.46	*	-
		1828(Pk)	54.62	74	-19.38
		1828(Av)	40.69	54	-13.31
		2742(Pk)	47.48	74	-26.52
		2742Av)	38.92	54	-15.08
		3656(Pk)	49.00	74	-25.00
		3656(Av)	42.82	54	-11.18
		4570(Pk)	52.94	74	-21.06
		4570(Av)	44.90	54	-09.10
		5484(Pk)	53.17	74	-20.83
		5484(Av)	45.29	54	-08.71
	Horizontal	914.05	93.88	*	-
		1828(Pk)	47.51	74	-26.49
		1828(Av)	42.76	54	-11.24
		2742(Pk)	47.32	74	-26.68
		2742(Av)	39.30	54	-14.70
		3656(Pk)	50.87	74	-23.13
		3656(Av)	45.44	54	-8.56
		4570(Pk)	51.14	74	-22.86
		4570(Av)	42.33	54	-11.67
		5484(Pk)	52.63	74	-21.37

		5484(Av)	44.28	54	-09.72
High (924MHz)	Vertical	924.04	101.18	*	-
		1848(Pk)	43.25	74	-30.75
		1848(Av)	37.70	54	-16.30
		2772(Pk)	48.51	74	-25.49
		2772(Av)	41.35	54	-12.65
		3696(Pk)	50.24	74	-23.76
		3696(Av)	44.30	54	-9.70
		4620(Pk)	53.72	74	-20.28
		4620(Av)	46.20	54	-7.80
		5544(Pk)	53.48	74	-20.52
		5544(Av)	45.63	54	-8.37
	Horizontal	924.04	92.45	*	-
		1848(Pk)	45.55	74	-28.45
		1848(Av)	40.19	54	-13.81
		2772(Pk)	47.92	74	-26.08
		2772(Av)	40.00	54	-14.00
		3696(Pk)	51.26	74	-22.74
		3696(Av)	45.46	54	-8.54
		4620(Pk)	52.93	74	-21.07
		4620(Av)	45.22	54	-8.78
		5544(Pk)	52.88	74	-21.12
		5544(Av)	45.36	54	-8.64

Antenna Type: UFL-cable integrated with Antenna

Channel	polarization	Frequency (MHz)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Low	Vertical	906.10	89.49	*	-
		1812(Pk)	47.88	74	-26.12
		1812(Av)	44.13	54	-9.87
		2718(Pk)	46.34	74	-27.66
		2718(Av)	38.69	54	-15.31
		3624(Pk)	50.26	74	-23.74
		3624(Av)	44.43	54	-9.57
		4529.8(Pk)	52.80	74	-21.20
		4530(Av)	44.31	54	-9.69
		5436(Pk)	52.89	74	-21.11
		5436(Av)	42.21	54	-11.79
	Horizontal	906.18	85.87	*	-
		1812(Pk)	49.46	74	-24.54
		1812(Av)	45.95	54	-8.05
		2718(Pk)	49.41	74	-24.59
		2718(Av)	42.29	54	-11.71
		3624(Pk)	56.40	74	-17.60
		3624(Av)	53.09	54	-0.91
		4530(Pk)	54.61	74	-19.39
		4530(Av)	46.37	54	-7.63
		5436(Pk)	54.22	74	-19.78

		5436(Av)	44.84	54	-9.16
Mid	Vertical	914.04	89.20	*	-
		1828(Pk)	44.20	74	-29.80
		1828(Av)	39.27	54	-14.73
		2742(Pk)	46.69	74	-27.31
		2742Av)	39.12	54	-14.88
		3656(Pk)	50.91	74	-23.09
		3656(Av)	45.07	54	-8.93
		4570(Pk)	55.68	74	-18.32
		4570(Av)	48.06	54	-5.94
		5484(Pk)	52.17	74	-21.83
		5484(Av)	41.46	54	-12.54
	Horizontal	914.05	84.78	*	-
		1828(Pk)	44.03	74	-29.97
		1828(Av)	38.97	54	-15.03
		2742(Pk)	49.44	74	-24.56
		2742(Av)	42.96	54	-11.04
		3656(Pk)	52.44	74	-21.56
		3656(Av)	48.16	54	-5.84
		4570(Pk)	56.10	74	-17.90
		4570(Av)	49.24	54	-4.76
		5484(Pk)	52.62	74	-21.38
		5484(Av)	42.99	54	-11.01
High	Vertical	924.04	89.19	*	-
		1848(Pk)	40.25	74	-33.75
		1848(Av)	32.59	54	-21.41
		2772(Pk)	46.99	74	-27.01
		2772(Av)	39.28	54	-14.72
		3696(Pk)	51.14	74	-22.86
		3696(Av)	45.24	54	-8.76
		4620(Pk)	55.85	74	-18.15
		4620(Av)	49.11	54	-4.89
		5544(Pk)	52.79	74	-21.21
		5544(Av)	40.94	54	-13.06
	Horizontal	924.04	84.07	*	-
		1848(Pk)	40.54	74	-33.46
		1848(Av)	32.07	54	-21.93
		2772(Pk)	49.19	74	-24.81
		2772(Av)	42.11	54	-11.89
		3696(Pk)	52.97	74	-21.03
		3696(Av)	48.88	54	-5.12
		4620(Pk)	57.57	74	-16.43
		4620(Av)	51.41	54	-2.59
		5544(Pk)	52.99	74	-21.01
		5544(Av)	44.79	54	-9.21

*** - -> Fundamental Frequency**
Pk - > Peak Detector
Av->Average Detector

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

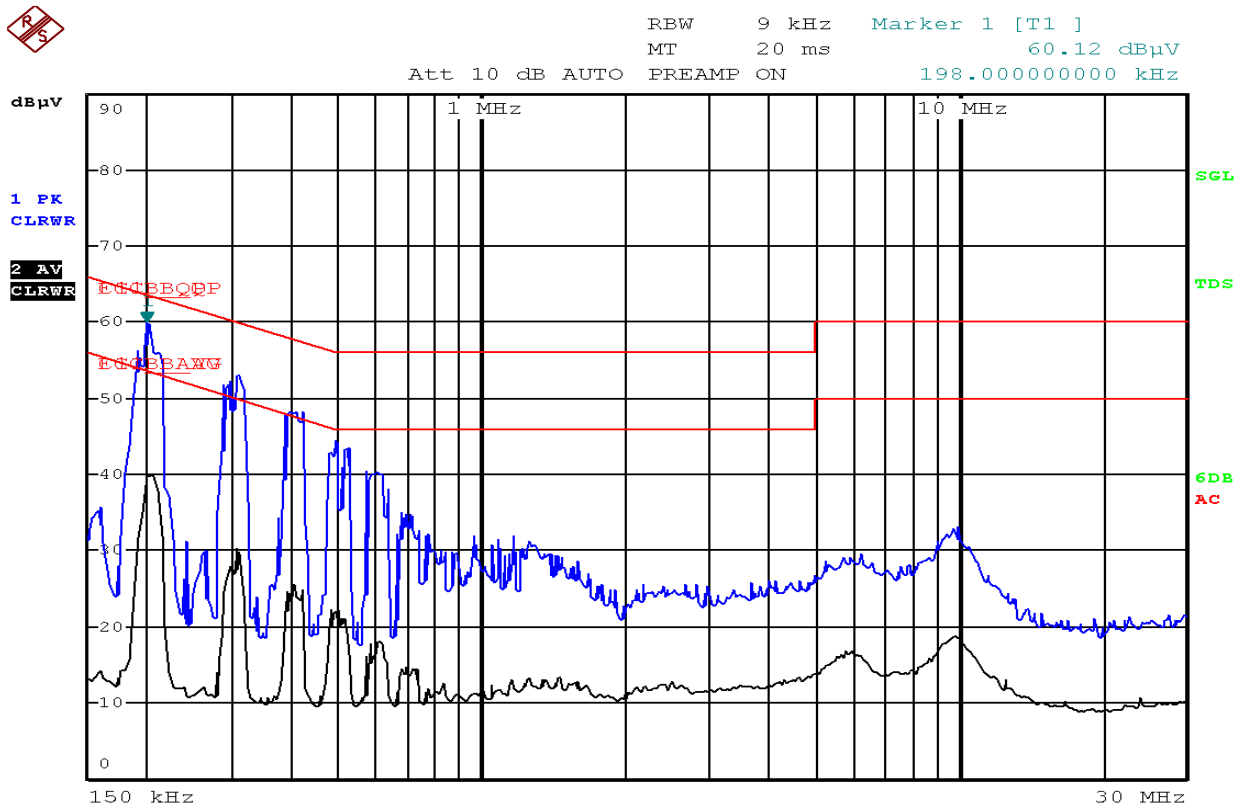
Test Specification	:	FCC Part 15 Section 15.207
Test Method	:	ANSI C63.4-2003
Testing Location	:	Screened room
Measurement Bandwidth	:	9kHz
Frequency Range	:	150kHz – 30MHz
Supply Voltage	:	120VAC,60Hz

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:

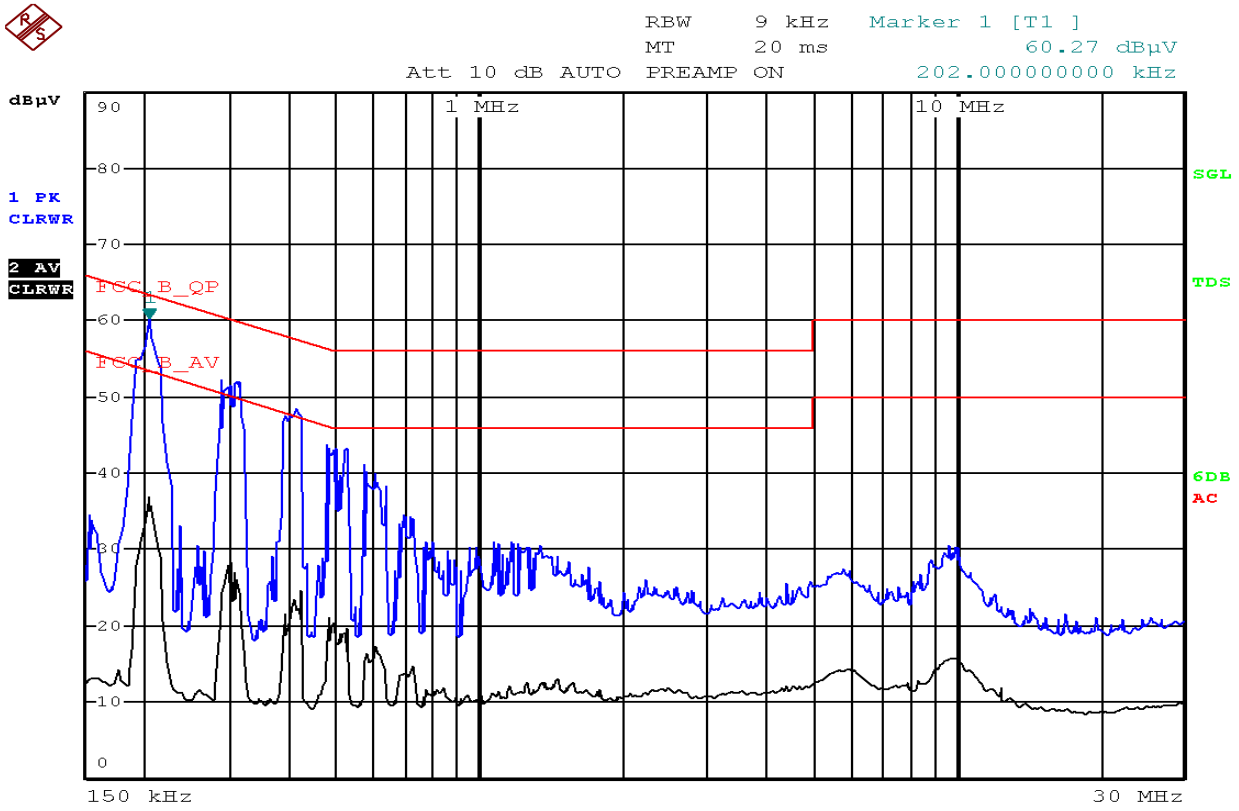


EDIT PEAK LIST (Final Measurement Results)

Trace1:	FCC_B_QP
Trace2:	FCC_B_AV
Trace3:	---

TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
1 Quasi Peak	198 kHz	55.99 L1	-7.69
1 Quasi Peak	306 kHz	49.46 L1	-10.60
1 Quasi Peak	394 kHz	44.40 L1	-13.57
2 Average	202 kHz	39.41 L1	-14.11
1 Quasi Peak	494 kHz	39.04 L1	-17.05
1 Quasi Peak	526 kHz	37.83 L1	-18.16
2 Average	306 kHz	29.30 L1	-20.77
1 Quasi Peak	574 kHz	35.21 L1	-20.78
2 Average	402 kHz	23.80 L1	-24.00
2 Average	498 kHz	21.60 L1	-24.42
2 Average	606 kHz	16.73 L1	-29.26
2 Average	9.706 MHz	18.04 L1	-31.95

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	55.84 N	-7.68
1 Quasi Peak	410 kHz	43.72 N	-13.92
1 Quasi Peak	286 kHz	46.40 N	-14.23
2 Average	202 kHz	34.98 N	-18.53
1 Quasi Peak	478 kHz	37.44 N	-18.92
1 Quasi Peak	526 kHz	36.83 N	-19.16
1 Quasi Peak	574 kHz	33.93 N	-22.06
2 Average	298 kHz	26.75 N	-23.54
2 Average	418 kHz	22.26 N	-25.22
2 Average	482 kHz	19.29 N	-27.01
2 Average	606 kHz	16.15 N	-29.84
2 Average	10.018 MHz	15.18 N	-34.81

Mode: Neutral