TÜVRheinland®

Produkte
Products

Prüfbericht - Nr.: *Test Report No.:*	**02422838 001**		**Seite 1 von 30** *Page 1 of 30*
Auftraggeber: *Client:*	**Honeywell Inc** **Automation and Control Solutions** **Honeywell International** **1985 Douglas Drive North Dock 1** **Golden Valley, MN 55422** **USA**		
Gegenstand der Prüfung: *Test item:*	**STRAW**		
Bezeichnung: *Identification:*	**AZW-5000**	**Serien-Nr.:** *Serial No.*	**Engineering Sample**
Wareneingangs-Nr.: *Receipt No.:*	**1403011756**	**Eingangsdatum:** *Date of receipt:*	**2010-11-18**
Prüfort: *Testing location:*	**Refer Page 4 of 30 for test facilities**		
Prüfgrundlage: *Test specification:*	**FCC 15, Subpart C**		
Prüfergebnis: *Test Result:*	**Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n).** *The test item passed the test specification(s).*		
Prüflaboratorium: *Testing Laboratory:*	**TÜV Rheinland (India) Pvt. Ltd.** Alpha Tower, Sigma Soft Tech Park, # 7, Whitefield Main Road, Varthur Kodi, Bangalore – 560066, India		

geprüft */ tested by:*

2010-12-01	Vinay.N Test Engineer	Vinay.N
Datum *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*

kontrolliert */ reviewed by:*

2010-12-02	Kalyan Varma G Manager	Cdym
Datum *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*

Sonstiges */Other Aspects:* **FCC ID : HS9AZWDGL**

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
15.247(b) (3)	Conducted Peak RF Output Power Test	Pass
15.247 (a) (2)	6dB Bandwidth	Pass
15.247 (e)	Power Spectral Density	Pass
15.247 (d)	Band-edge Compliance	Pass
15.209	Spurious Radiated Emissions – Transmission Mode	Pass
15.207	Conducted Emission Test on A C Power Line	Pass

Content

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List of Test and Measurement Instruments

Wipro Technologies, Bangalore

List of Test and Measurements

Equipment	Manufacturer	Type	S/N	Calibration Due Date
EMI Test Receiver	Rohde & Schwarz	ESIB40	100306	24.07.2011
Hybrid Log Periodic Antenna	TDK	HLP3003C	130334	17.02.2011
Broadband Horn Antenna	Schwarzbeck Mess-Electronik	BBHA9170	9170-344,2007	14.02.2011
Double Ridged Horn Antenna	Schwarzbeck Mess-Electronik	BBHA9120D	2008	14.08.2011
Pre-Amplifier	TDK-RFSolution	PA-02	100008	15.02.2011

Testing Facilities

1) Wipro Technologies
Survey No. 70, 77, 78 / 8A, Dodda Kannelli,
Sarjapur Road, Bangalore – 560 035
India

General Product Information

Product Function and Intended Use

The AZW-5000 is a BACnet compliant wireless device intended to enable the legacy Alerton BACnet Controllers to be able to establish a wireless network. This devices operates on ZigBee at wireless front, embracing BACnet in accordance with Addendum q.

Ratings and System Details

Operating Frequency		2405-2475 MHz
No. of channel		15
Channel Spacing		5MHz
Transmitted Power		12 dBm
Modulation		DSSS
Data Rate		250Kbps
Antenna Type		Internal PCB mount and Edge Mount
Number of antenna		Three
Antenna Gain	Internal Horizontal	-3 dBi
	Internal Vertical	-3 dBi
	External Antenna	2.2 dBi
Supply Voltage		24V AC
Dimensions		140.0 x 81.0 x 56.0 mm
Environmental		Operating Temperature: -40°C to +65.5°C Relative Humidity : -5% to 95% (Non Condensing)

Test Conditions:

Voltage: 110V **Frequency:** 60 Hz

Environmental conditions:

Temperature: +23 ° C **RH:** 62%

Operation Descriptions

- AT91SAM7S512 ARM7 controller operating with external crystal of 16MHz and internal core operating frequency is 48MHz
- MSP430F5437 controller operating with internal RC oscillator at 16MHz
- CC2520 RF Radio operating with external crystal of 32MHz
- SPI clock is operated at 4MHz
- ¼ unit load RS485 interface operating at max. 76.8Kbps

Power Level Settings

Antenna	Make	Gain (dBi)	Power Level Setting (dBm)
Internal Horizontal	BI-LINK METAL SPECIALTIES	- 3	12
Internal Horizontal	BI-LINK METAL SPECIALTIES	- 3	12
External Antenna	Linx Technologies	2.2	10

Test Set-up and Operation Mode

Principle of Configuration Selection

The test was performed under continuous transmission to obtain the maximum emissions.

Test Operation and Test Software

A keypad embedded on PCB was 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

No Special Accessories used During Testing

Countermeasures to achieve EMC Compliance

- None

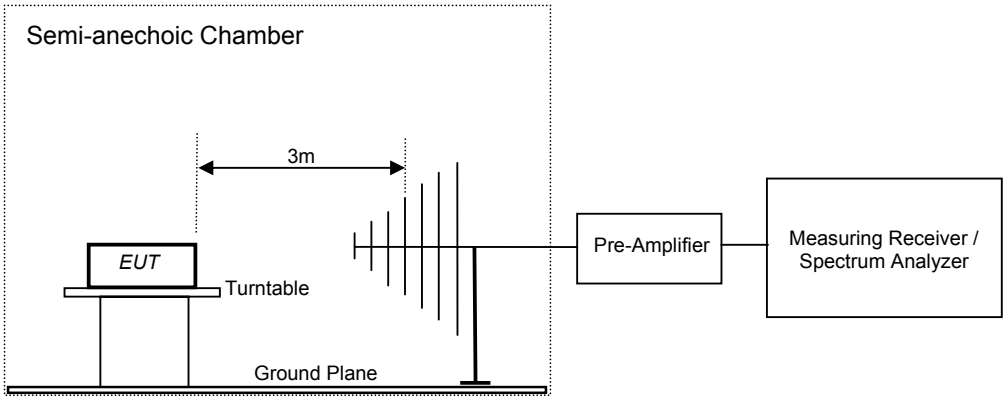
Table of carrier frequencies

Frequency Band	Channel No.	Frequency (MHz)
2400-2483.5 MHz	01	2405
	02	2410
	03	2415
	04	2420
	05	2425
	06	2430
	07	2435
	08	2440
	09	2445
	10	2450
	11	2455
	12	2460
	13	2465
	14	2470
	15	2475

Test Methodology

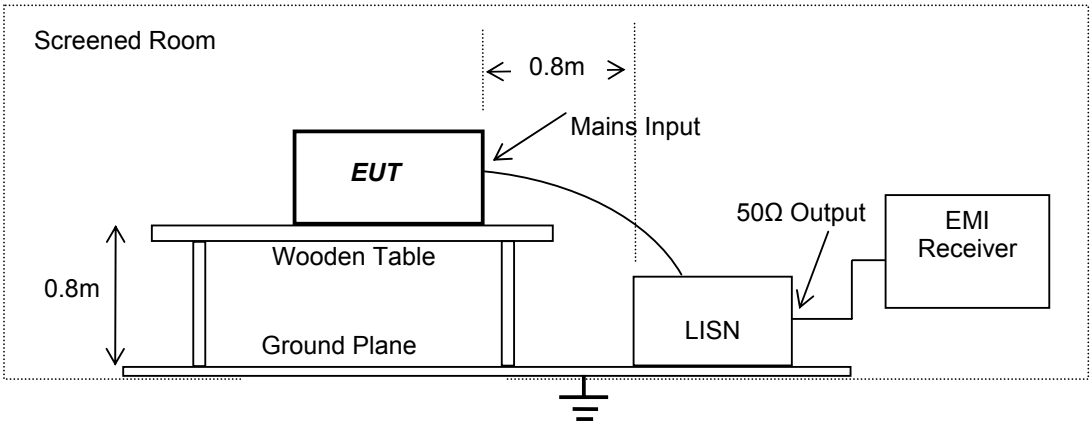
Radiated Emission Test

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 where the antenna height was varied manually in steps of 1m. The measurement below 30MHz was performed by loop antenna.



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.



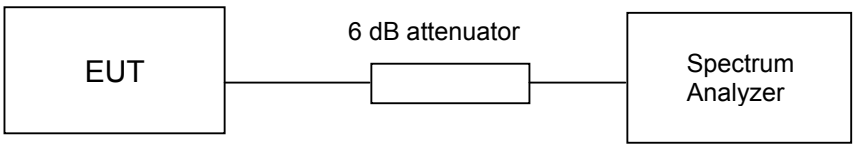
Test Results

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

Result **Pass**

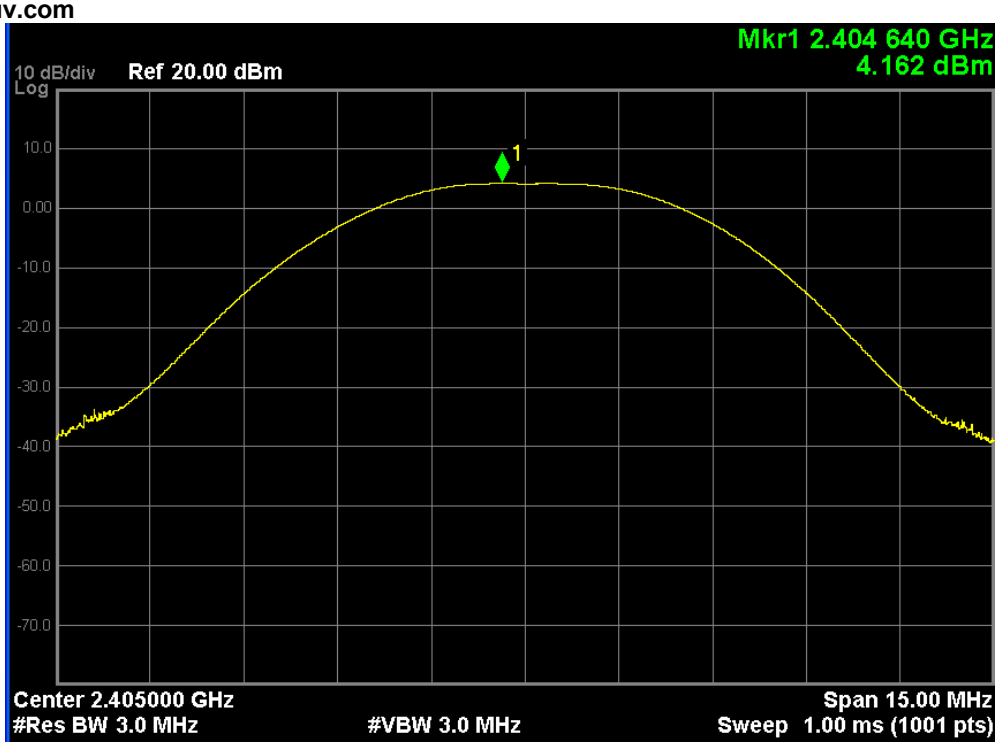
Test Specification	FCC 15.247 (b)(3)
Measurement Bandwidth (RBW)	1 MHz
Detector	Peak
Requirement	<1 watt (30dBm)

Test Method:

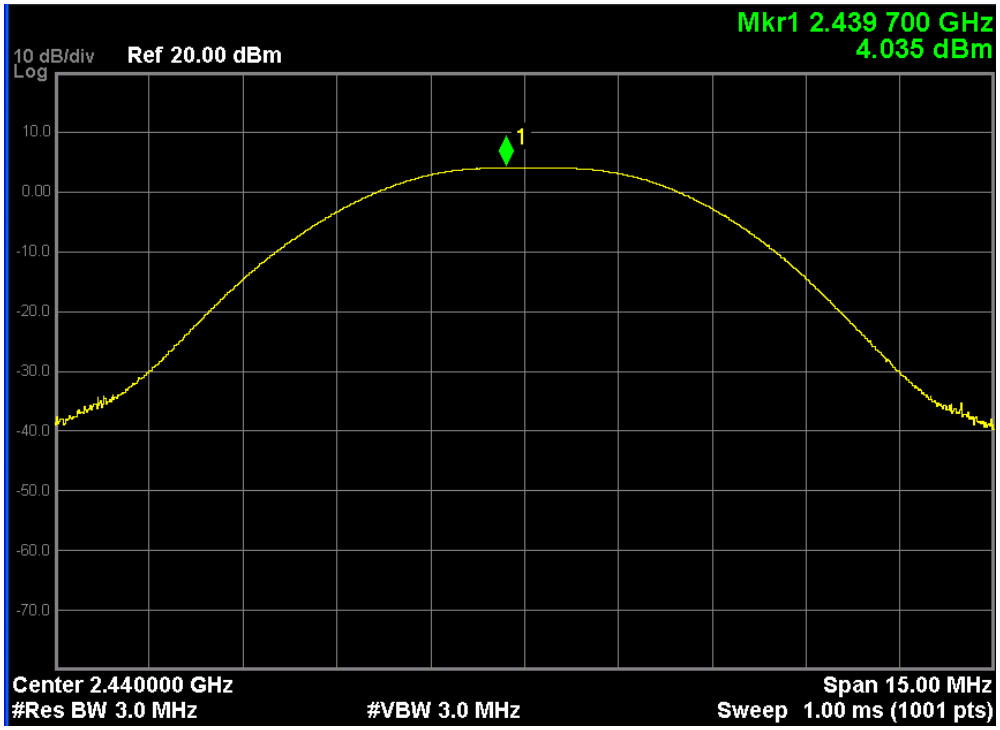


Test Result:

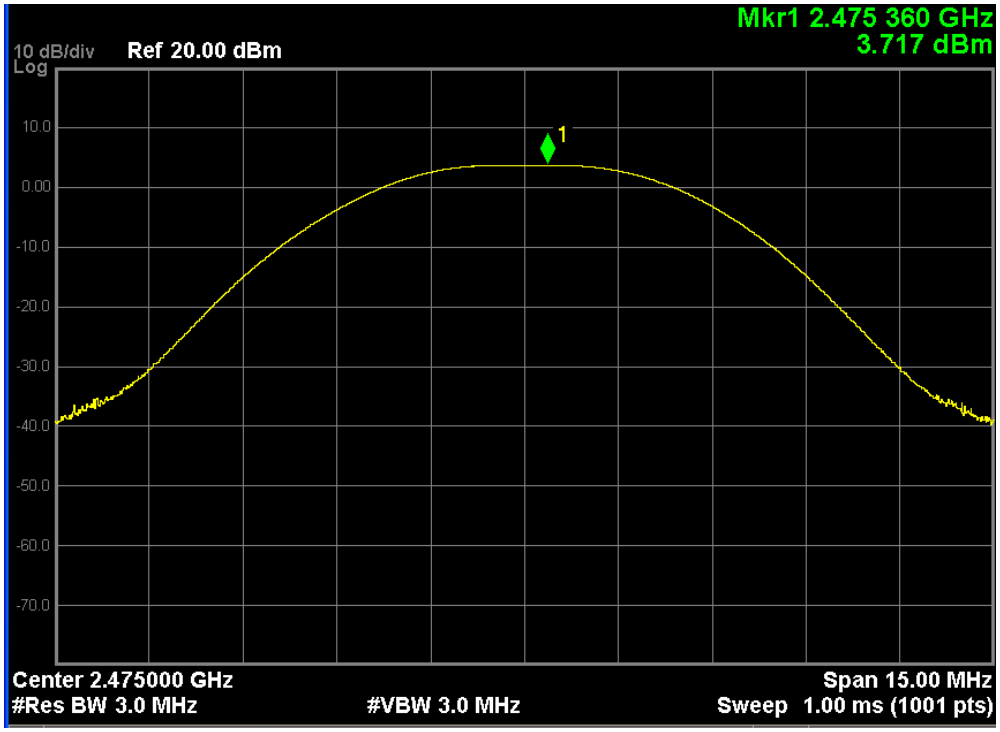
Channel	Frequency (MHz)	Measured RF Output power (dBm)	Attenuator + Cable Loss (dB)	Total Output power (dBm)	Limit (dBm)	Remarks
Low	2405	4.16	7.28	11.44	30	Pass
Mid	2440	4.03	7.28	11.31	30	Pass
High	2475	3.71	7.28	10.99	30	Pass



Channel Frequency: 2405 MHz



Channel Frequency: 2440 MHz



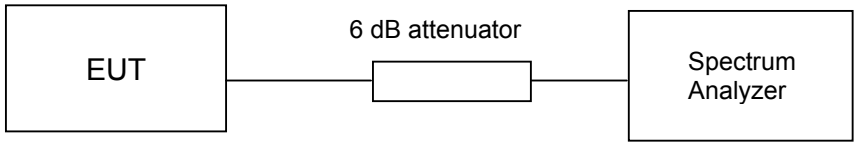
Channel Frequency: 2475 MHz

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

Result **Pass**

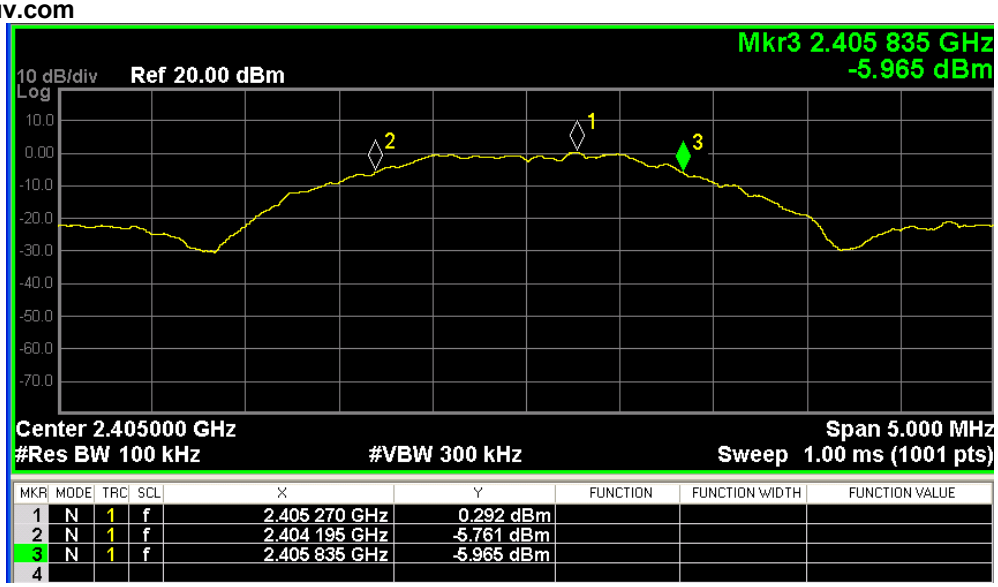
Test Specification FCC Part 15 Section 15.247 (a) (2)
Detector Function Peak
Requirement The minimum 6 dB bandwidth shall be at least 500 kHz.

Test Method:

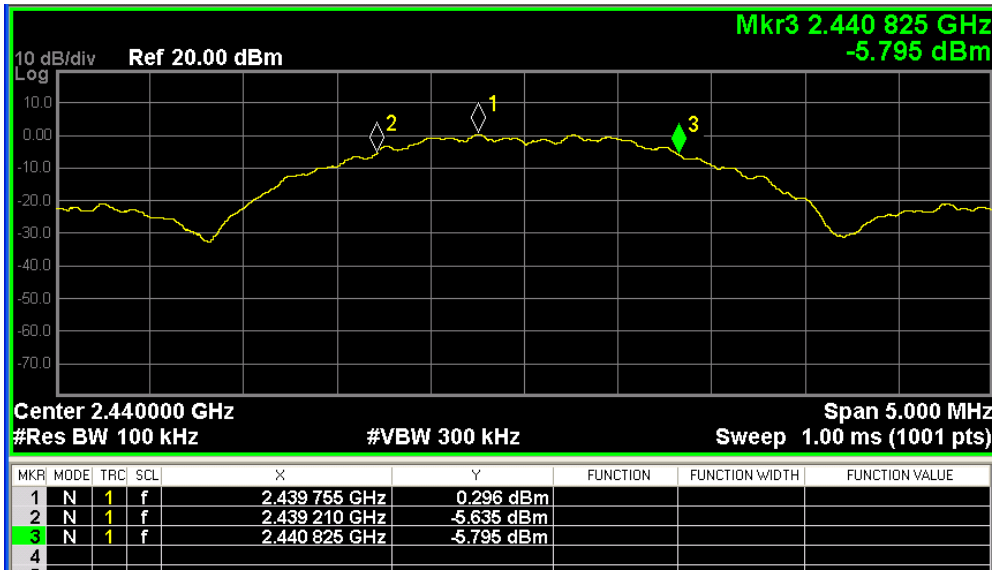


Test Result:

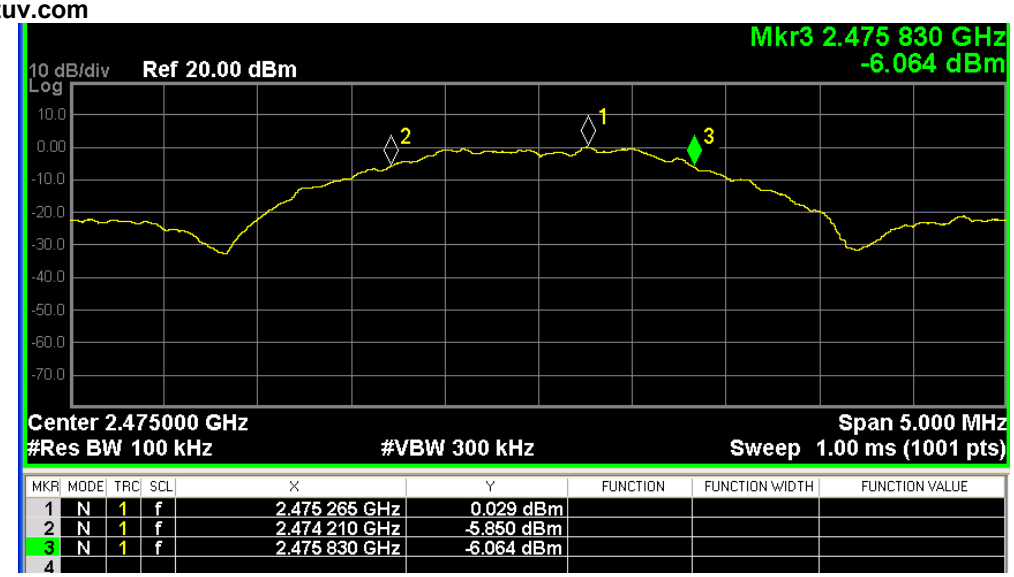
Carrier Frequency (MHz)	Lower Frequency (MHz)	Upper Frequency (MHz)	6 dB Bandwidth (MHZ)	99% Occupied Bandwidth (Hz)
2405	2404.19	2405.83	1.64	2.844
2440	2439.21	2440.82	1.61	2.801
2475	2474.21	2475.83	1.62	2.834



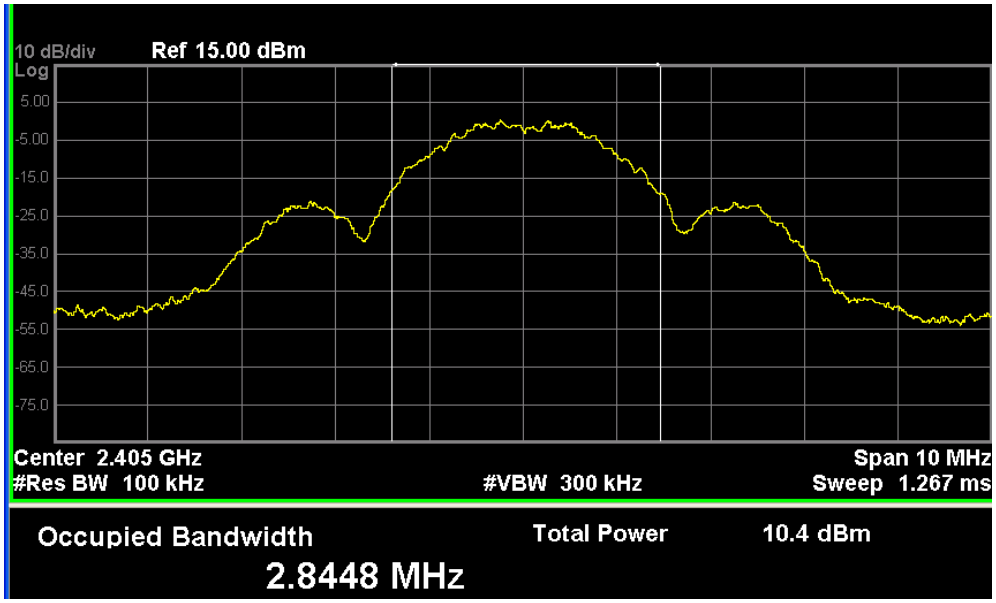
6 dB Bandwidth: Channel Frequency 2405 MHz



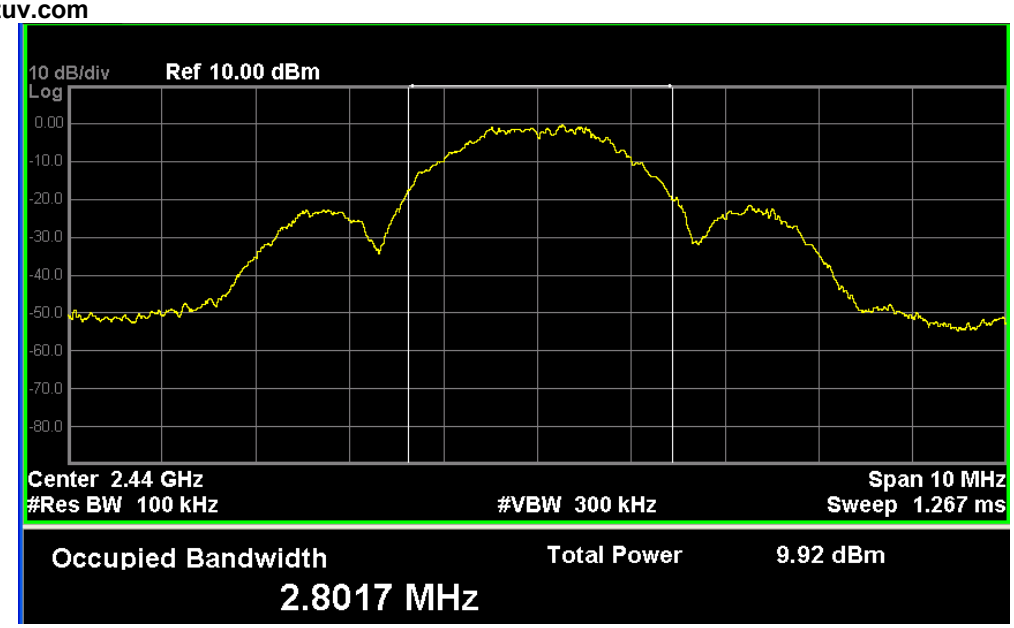
6 dB Bandwidth: Channel Frequency 2440 MHz



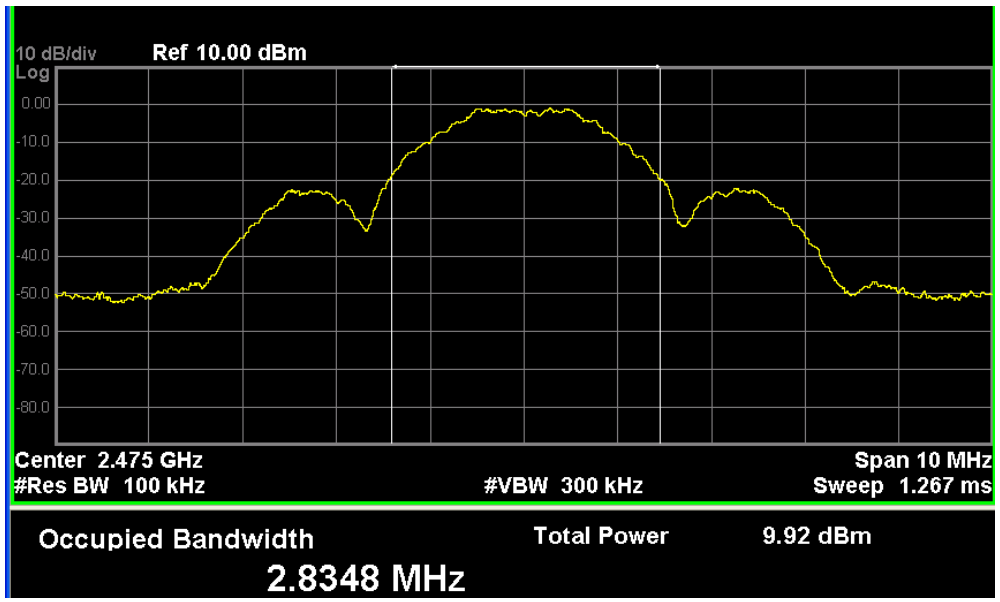
6 dB Bandwidth: Channel Frequency 2475 MHz



OBW: Channel Frequency 2405 MHz



OBW: Channel Frequency 2440 MHz



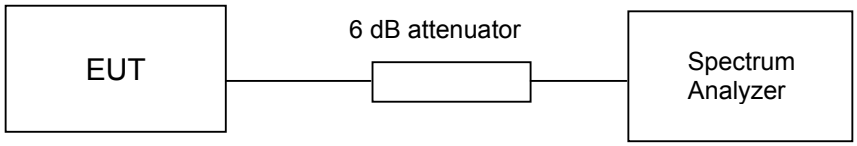
OBW: Channel Frequency 2475 MHz

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

Result **Pass**

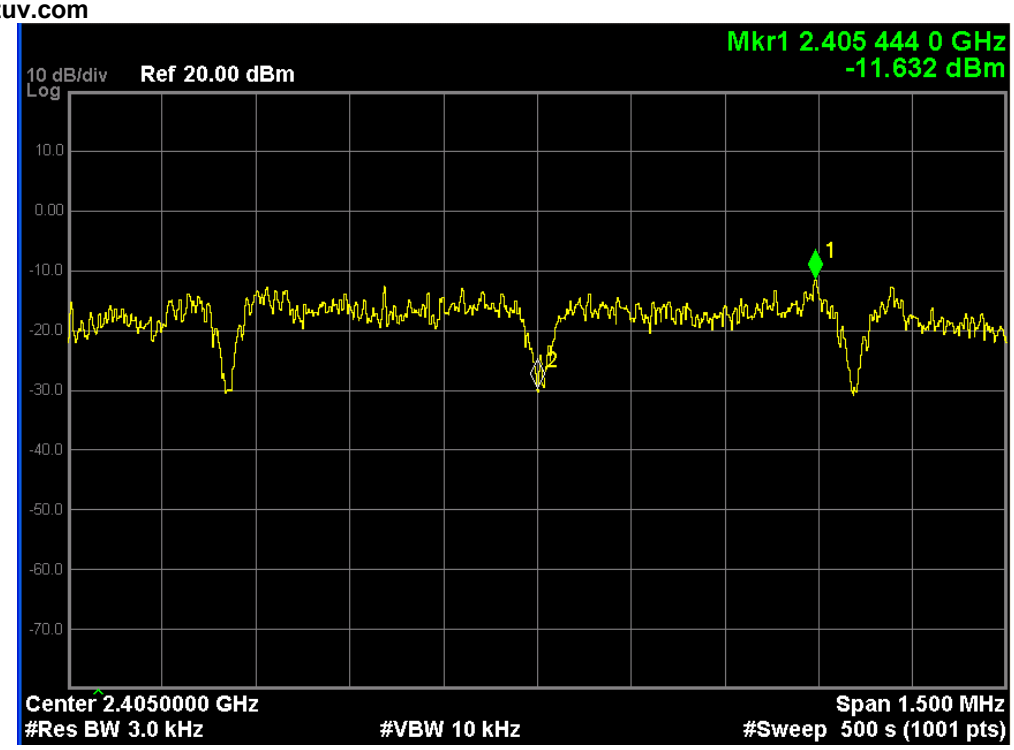
Test Specification	FCC Part 15 Section 15.247 (e)
Detector Function	Peak
Requirement	For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Test Method:

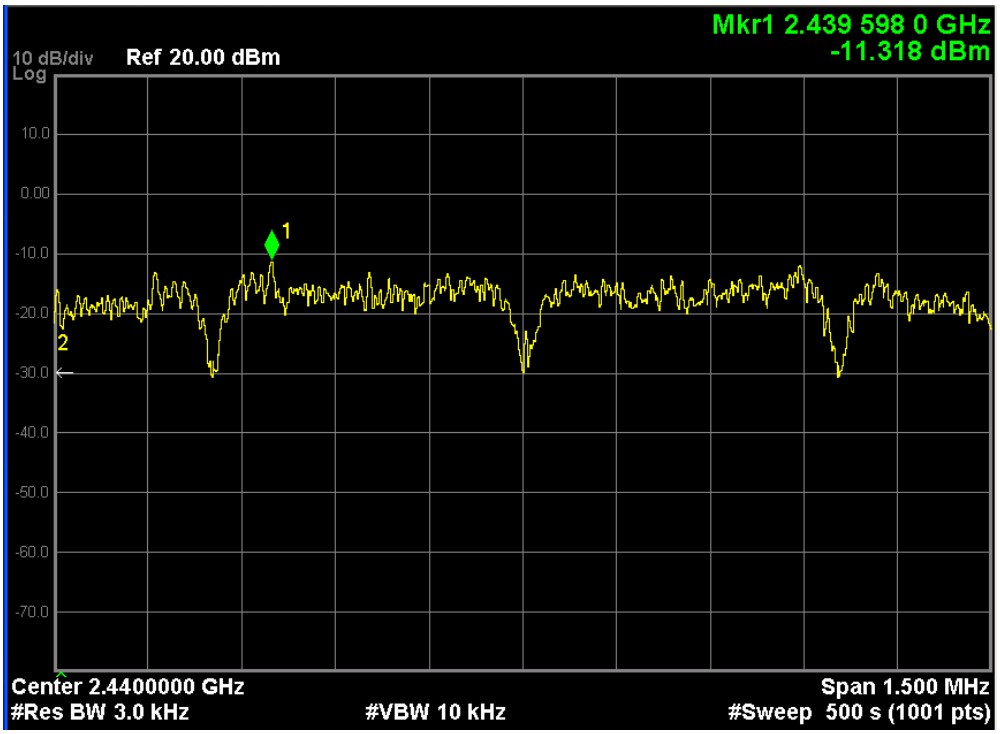


Test Result:

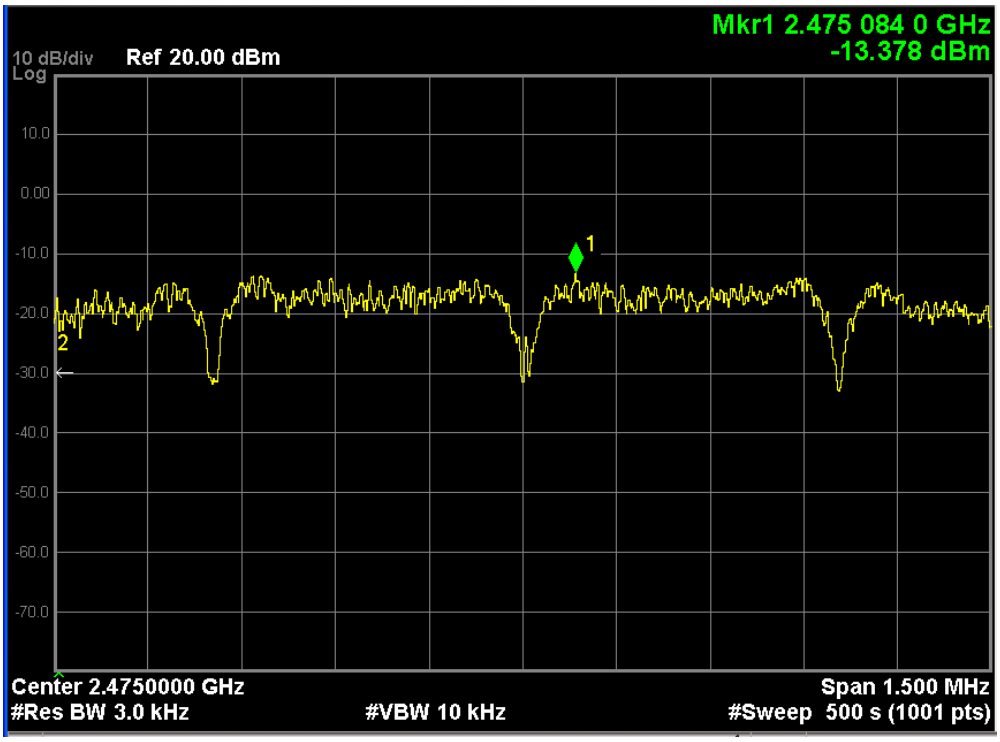
Frequency (MHz)	Measured RF Output power (dBm)	Cable Loss (dB)	PSD (dBm)	Limit (dBm)	Verdict
2405	-11.63	7.28	-4.35	8.00	Pass
2440	-11.31	7.28	-4.03	8.00	Pass
2475	-13.37	7.28	-6.09	8.00	Pass



Channel Frequency 2405 MHz



Channel Frequency 2440 MHz



Channel Frequency 2475 MHz

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

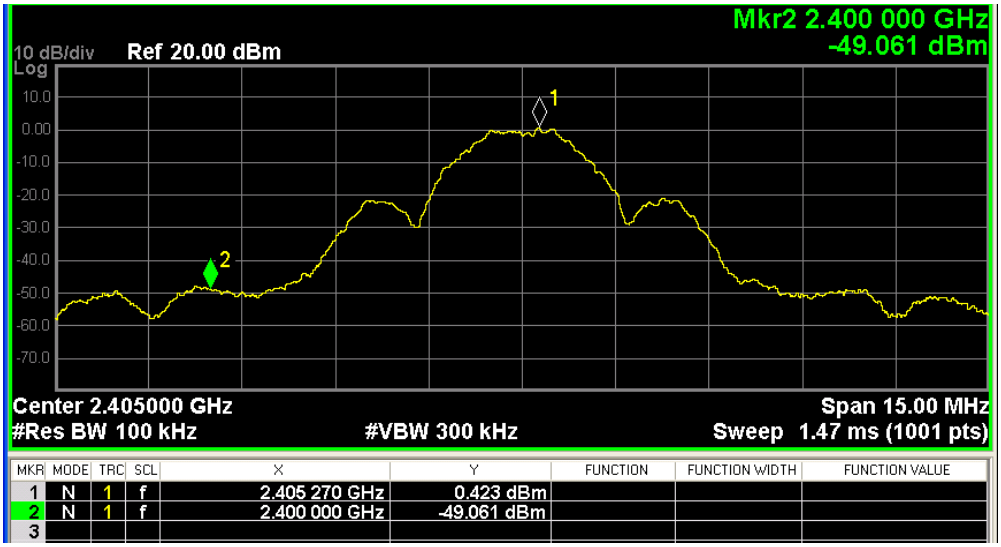
Result **Pass**

Test Specification	FCC Part 15, Subpart C
Detector Function	Peak
Requirement	In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

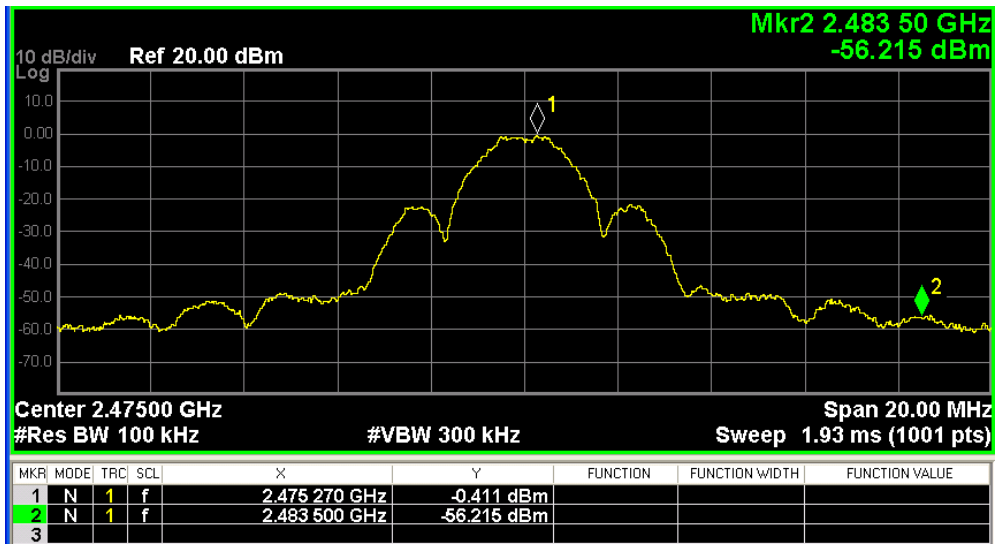
Test Method:

Test Result:

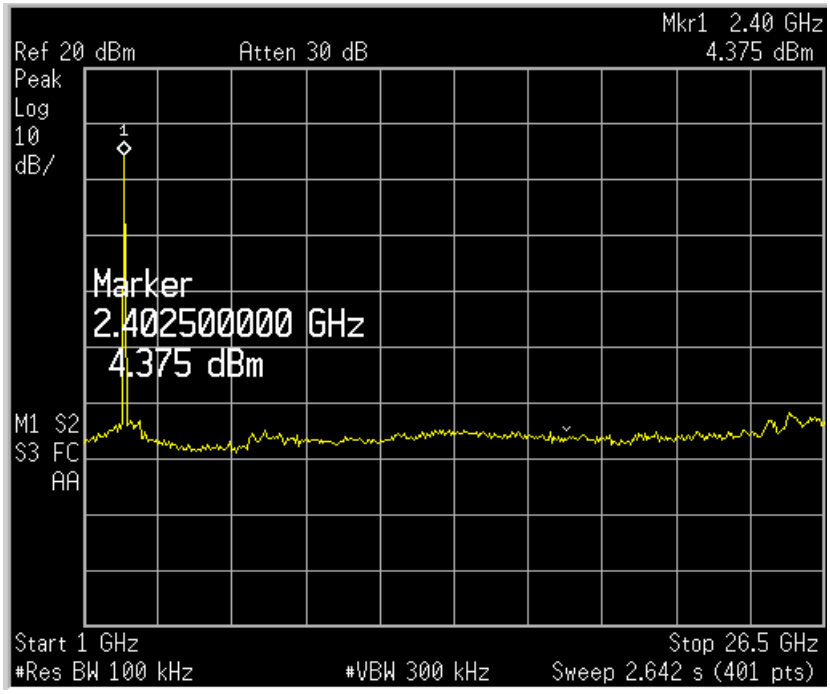
Channel	Fundamental Frequency (MHz)	Value at Band Edge		Limit (dB)	Remarks
		Frequency (MHz)	Value (dB)		
Low	2405	2400.0	-49.484	-20	Pass
High	2475	2483.5	-55.804	-20	Pass



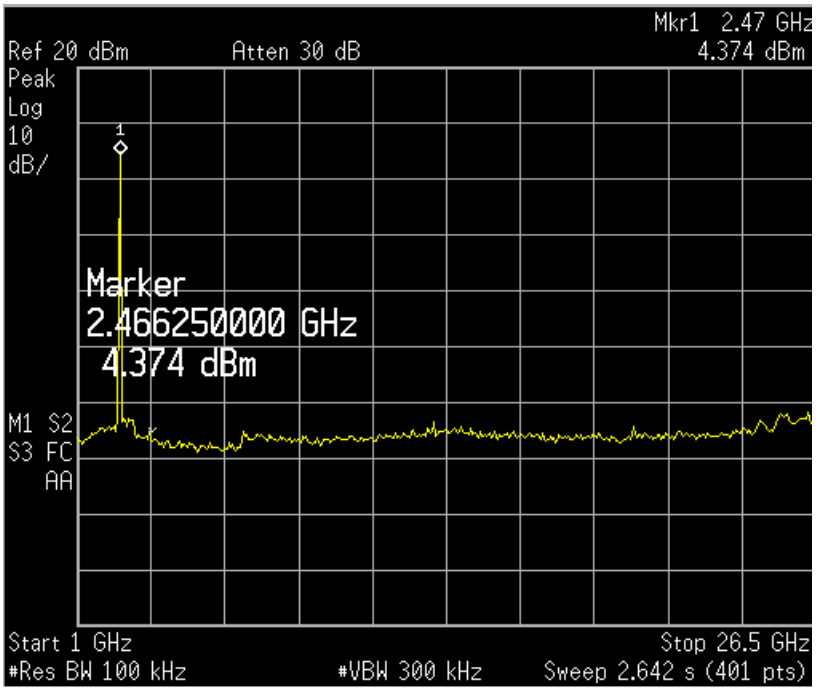
Channel Frequency 2405 MHz



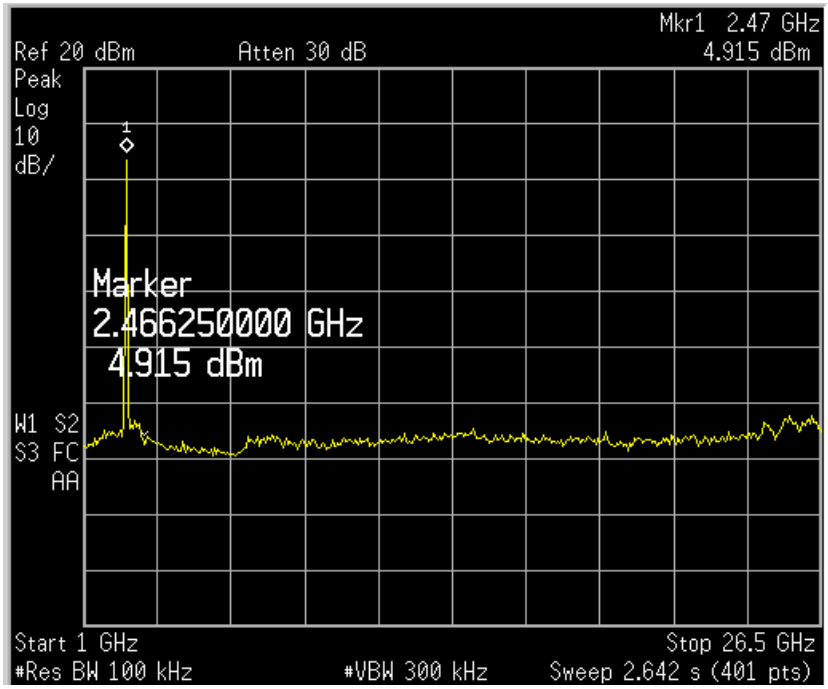
Channel Frequency 2475 MHz



Channel Low



Channel Mid



Channel High

Spurious Radiated Emissions **Section 15.209**

Result **Pass**

Test Specification	F CC 15.209
Test Method	ANSI C63.4-2003
Measurement Location	Semi Anechoic Chamber
Supply Voltage	110 Volt 60Hz AC
Measuring Frequency Range	9kHz – 10GHz(Up to 10th harmonic of the highest fundamental frequency)
Measuring Distance	3m
Detection	QP for frequency below 1GHz, Average for frequency above 1GHz
Requirement	Should meet the limits as mentioned in table below

Limit for Radiated Emission of Section 15.209:

Frequency (MHz)	Field strength (μV/m)	Field strength (dBμV/m) at 3m range
0.009 – 0.490	2400/F(kHz) (300m range)	48.50 – 13.80 (300m range)*
0.490 – 1.705	24000/F(kHz) (30m range)	33.80 – 23.00 (30m range)*
30-88	100	40.0
88-216	150	43.5
216-960	200	46.0
Above 960	500	54.0

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.

Limit for Restricted bands of Operation of section 15.205:

In the restricted bands of operation at band edges i.e 2310MHz – 2390MHz and 2483.5MHz – 2500 MHz the product shall show compliance as per section 15.209

External Antenna

Channel	Antenna Polarization	Spurious Emission (MHz)	Field strength (dBµV/m)	limit	Margin (dbm)
Low 2405	H	192.05	18.38	43.50	-25.12
		544.10	32.28	46.00	-13.72
		870.20	33.17	46.00	-12.83
		2390.00 (P)	55.00	74.00	-19.00
		2390.00 (Av)	41.00	54.00	-13.00
		2405.30 (P)	93.00	*	-
		2405.40 (Av)	87.50	*	-
		4811.00 (P)	53.82	74.00	-20.18
		4811.00 (Av)	48.13	54.00	-05.87
	V	192.02	17.30	43.50	-26.20
		544.10	38.40	46.00	-07.60
		608.05	37.30	46.00	-08.70
		2390.00 (A)	56.00	74.00	-18.00
		2390.00 (Av)	41.00	54.00	-13.00
		2405.50 (P)	107.50	*	-
		2405.50 (Av)	103.50	*	-
		4811.00 (P)	49.84	74.00	-24.16
		4811.00 (Av)	44.07	54.00	-09.39
Mid 2440	H	192.02	17.60	43.50	-25.90
		344.30	22.10	46.00	-23.90
		544.10	27.20	46.00	-18.80
		2440.00 (P)	95.00	*	-
		2440.00 (Av)	90.50	*	-
		4880.00 (P)	48.00	74.00	-26.00
		48800.00 (Av)	42.33	54.00	-11.67
	V	32.30	21.40	40.00	-18.60
		192.40	18.30	43.50	-25.20
		544.40	39.20	43.50	-04.30
		608.30	36.30	43.50	-07.20
		2440.00 (P)	106.50	*	-
		2440.00 (Av)	104.50	*	-
		4880.00 (P)	52.69	74.00	-21.31
		4880.00 (Av)	47.03	54.00	-06.97
High 2475	H	192.50	16.40	40.00	-23.60
		544.30	29.50	46.00	-16.50
		2475.00 (P)	97.00	*	-
		2475.00 (Av)	92.50	*	-
		2483.5 (P)	55.94	74.00	-18.06
		2483.5 (Av)	43.65	54.00	-10.35
		4950.00 (P)	57.36	74.00	-16.64
		4950.00 (Av)	47.59	54.00	-06.41
	V	192.50	21.20	43.50	-22.30
		512.60	36.20	46.00	-09.80
		544.40	38.40	46.00	-07.60

		2475.00 (P)	108.00	*	-
		2475.00 (Av)	105.00	*	-
		2483.50 (P)	59.03	74.00	-14.97
		2483.50 (Av)	47.99	54.00	-06.01
		4950.00 (P)	49.66	74.00	-24.34
		4950.00 (Av)	47.44	54.00	-06.56

* - →Operating Frequency
P→ Peak Detector
Av→ Average Detector

Internal Vertical Antenna

Channel	Antenna Polarization	Spurious Emission (MHz)	Field strength (dBµV/m)	limit	Margin (dbm)
Low 2405	H	192.02	18.20	43.50	-25.30
		544.04	30.00	46.00	-16.00
		2390.00 (P)	53.00	74.00	-21.00
		2390.00 (Av)	42.50	54.00	-11.50
		2405.00 (P)	92.00	*	-
		2405.00 (Av)	84.00	*	-
		4811.00 (P)	50.55	74.00	-23.45
		4811.00 (Av)	44.09	54.00	-09.10
	V	32.05	22.00	40.00	-18.00
		508.00	29.00	46.00	-17.00
		544.70	31.00	46.00	-15.00
		2390.00 (P)	54.00	74.00	-20.00
		2390.00 (Av)	42.50	54.00	-11.50
		2405.50 (P)	97.00	*	-
		2405.50 (Av)	92.00	*	-
		4811.00 (P)	48.98	74.00	-25.02
		4811.00 (Av)	43.33	54.00	-10.67
Mid 2440	H	192.40	20.00	43.50	-23.50
		354.70	24.70	46.00	-21.30
		544.30	30.00	46.00	-16.00
		2440.00 (P)	90.80	*	-
		2440.00 (Av)	83.00	*	-
		4880.00 (P)	49.42	74.00	-24.58
		4880.00 (Av)	43.78	54.00	-10.22
	V	192.05	22.00	43.50	-21.50
		508.05	34.00	46.00	-12.00
		544.05	37.00	46.00	-09.00

		860.00	35.00	46.00	-11.00
		2440.00 (P)	98.00	*	-
		2440.00 (Av)	93.00	*	-
		4880.00 (P)	46.92	74.00	-27.08
		4880.00 (Av)	46.46	54.00	-12.73
High 2475	H	215.00	22.00	43.50	-21.50
		544.00	32.05	46.00	-13.95
		2483.50 (P)	55.60	74.00	-18.40
		2483.50 (Av)	42.95	54.00	-11.05
		2475.00 (P)	93.00	*	-
		2475.00 (Av)	87.50	*	-
		4950.00 (P)	46.58	74.00	-27.42
		4950.00 (Av)	36.29	54.00	-17.17
	V	192.05	22.04	43.50	-21.46
		508.04	34.00	46.00	-12.00
		544.20	36.30	46.00	-09.70
		2483.50 (P)	57.23	74.00	-16.77
		2483.50 (Av)	43.97	54.00	-10.03
		2475.00(P)	101.00	*	-
		2475.00(Av)	96.50	*	-
		4950.00(P)	49.55	74.00	-24.45
		4950.00(Av)	42.37	54.00	-11.63

* - →Operating Frequency
P→ Peak Detector
Av→ Average Detector

Internal Horizontal Antenna

Channel	Antenna Polarization	Spurious Emission (MHz)	Field strength (dBµV/m)	limit	Margin (dbm)
Low 2405	H	192.04	20.03	43.50	-23.47
		544.05	32.30	46.00	-13.70
		2390.00 (P)	55.00	74.00	-19.00
		2390.00 (Av)	43.00	54.00	-11.00
		2405.00 (P)	98.00	*	-
		2405.00 (Av)	92.50	*	-
		4811.00 (P)	55.23	74.00	-18.77
		4811.00 (Av)	49.58	54.00	-04.42
	V	192.40	21.70	43.50	-21.80
		508.20	33.20	46.00	-12.80
		544.05	34.60	46.00	-11.40
		564.00	35.20	46.00	-10.80

		2390.00 (P)	55.50	74.00	-18.50
		2390.00 (Av)	43.00	54.00	-11.00
		2405.00 (P)	96.00	*	-
		2405.00 (Av)	90.00	*	-
		4811.00 (P)	53.32	74.00	-20.68
		4811.00 (Av)	47.67	54.00	-06.33
Mid 2440	H	154.02	22.00	43.50	-21.50
		355.30	25.80	46.00	-20.20
		560.40	30.60	46.00	-15.40
		2440.00 (P)	97.00	*	-
		2440.00 (Av)	88.81	*	-
		4880.00 (P)	54.45	74.00	-19.55
		4880.00 (Av)	48.80	54.00	-05.20
	V	192.05	23.60	43.50	-19.90
		508.40	34.00	46.00	-12.00
		544.30	36.30	46.00	-09.70
		563.70	35.20	46.00	-10.80
		2440.00 (P)	98.00	*	-
		2440.00 (Av)	90.81	*	-
		4880.00 (P)	55.68	74.00	-18.32
		4880.00 (Av)	47.03	54.00	-06.97
High 2475	H	192.03	21.30	40.00	-18.70
		354.20	25.60	46.00	-20.40
		565.60	30.50	46.00	-15.50
		2483.50 (P)	55.50	74.00	-18.50
		2483.50 (Av)	43.48	54.00	-10.52
		2475.00 (P)	97.50	*	-
		2475.00 (Av)	91.50	*	-
		4950.00 (P)	52.95	74.00	-21.05
		4950.00 (Av)	45.98	54.00	-08.02
	V	162.40	22.03	43.50	-21.47
		508.20	34.10	46.00	-11.90
		544.05	35.02	46.00	-10.98
		564.00	36.50	46.00	-09.50
		2483.50 (P)	56.12	74.00	-17.88
		2483.50 (Av)	43.48	54.00	-10.52
		2475.00 (P)	97.00	*	-
		2475.00 (Av)	91.50	*	-
		4950.00 (P)	52.17	74.00	-21.83
		4950.00 (Av)	45.52	54.00	-08.48

* - →Operating Frequency
P→ Peak Detector
Av→ Average Detector

Conducted Emission Test on a.c. Power Line **Section 15.207**

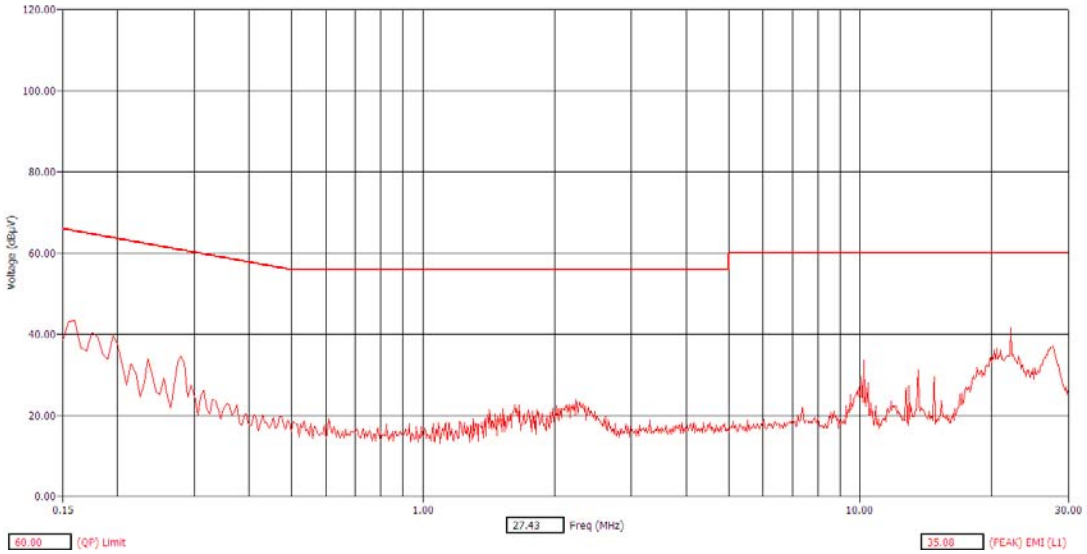
Result **Pass**

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	:	110 Volt 60Hz AC

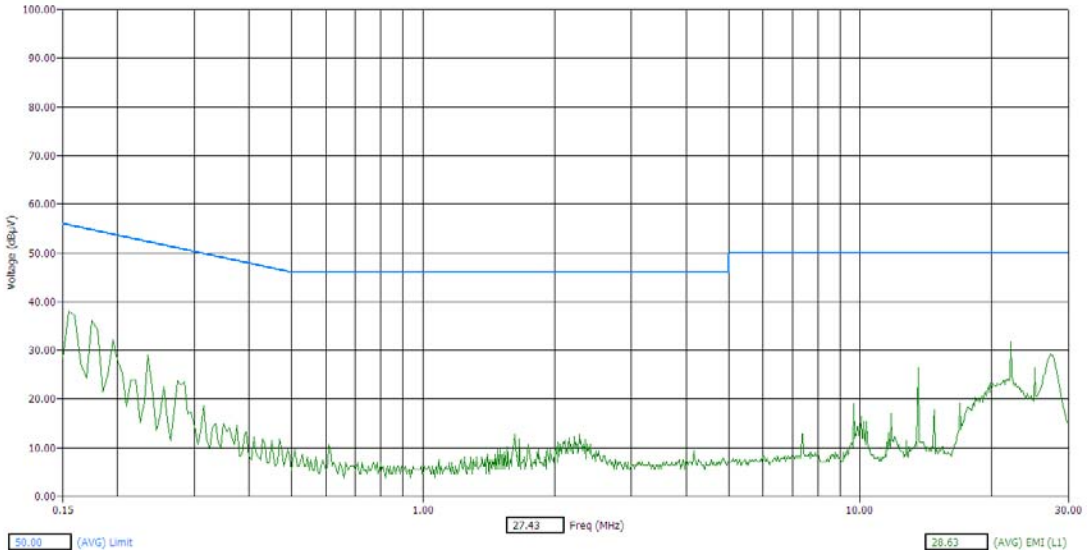
Test Result:

Conductor	Frequency of Emission(MHz)	Emission Level (QP) (dBµV)	QP Limit (dBµV)	Margin (dB)	Result
Line	09.99	19.39	60	-40.64	Pass
	10.33	15.38	60	-44.62	Pass
	13.53	14.40	60	-45.60	Pass
	14.73	26.01	60	-33.99	Pass
	22.11	37.67	60	-22.33	Pass
	22.15	38.53	60	-21.47	Pass
Neutral	09.99	18.66	60	-41.34	Pass
	10.33	16.83	60	-43.17	Pass
	13.53	14.09	60	-45.91	Pass
	14.73	25.27	60	-34.73	Pass

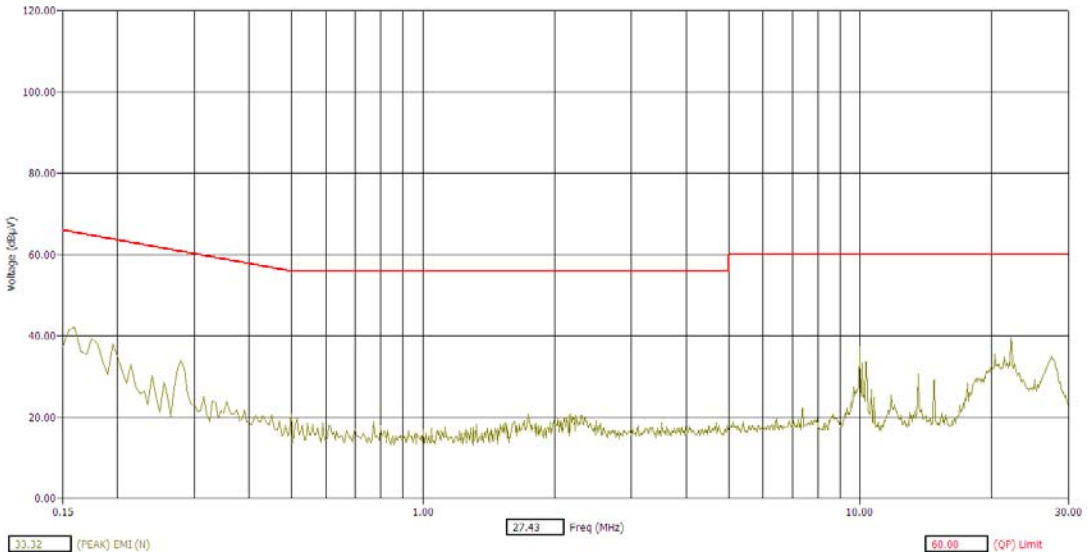
Conductor	Frequency of Emission(MHz)	Emission Level (Av) (dBµV)	Average Limit (dBµV)	Margin (dB)	Result
Line	09.99	09.59	50	-40.41	Pass
	10.33	08.74	50	-41.26	Pass
	13.53	08.89	50	-41.11	Pass
	14.73	12.25	50	-37.75	Pass
	22.11	26.33	50	-23.67	Pass
	22.15	27.20	50	-22.8	Pass
Neutral	9.99	10.14	50	-39.86	Pass
	10.33	09.55	50	-40.45	Pass
	13.53	08.43	50	-41.57	Pass
	14.73	11.36	50	-38.64	Pass



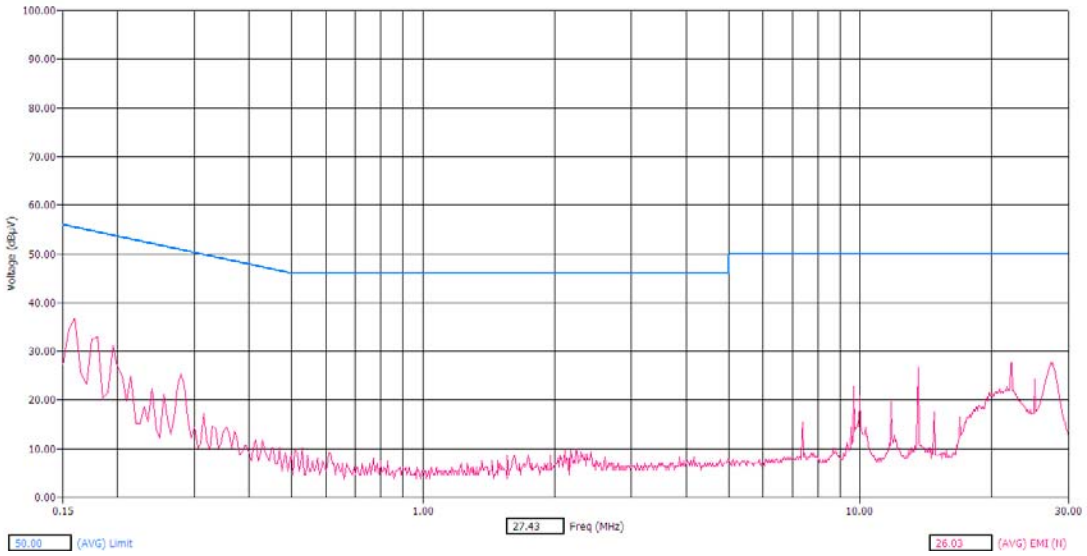
LINE: Peak



LINE: Average



NEUTRAL: Peak



NEUTRAL: Average