



FCC 47 CFR PART 15 SUBPART C
FCC ID: Z8QTZPWS02
TEST REPORT

For

Applicant: MyEnergy Domain, Inc.

Address: 5604 Nicholas St, Omaha NE 68132, United States

Product Name: Smart thermostat

Model Name: TZ-PWS-02

Brand Name: N/A

FCC ID: Z8QTZPWS02

Report No.: STS1408018F01

Date of Issue: Aug.23, 2014

Prepared by

Shenzhen STS Test Services Co., Ltd.

**1/F, Building 2, Zhuoke Science Park, Chongqing Road, Fuyong,
Baoan District, Shenzhen, China**

TEL: +86-755 6119 6328

FAX: +86-755 6119 6328

E-mail: sts@stsapp.com

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**1. VERIFICATION OF CONFORMITY**

Applicant's name : MyEnergy Domain, Inc.
Address : 5604 Nicholas St, Omaha NE 68132, United States
Manufacture's Name : MyEnergy Domain, Inc.
Address : 5604 Nicholas St, Omaha NE 68132, United States
Product description :
Product name.....: Smart thermostat
Model and/or type reference .: TZ-PWS-02
Serial Model..... : N/A
Ratings DC 3.8V
Standards : FCC Part15.249
Test procedure: ANSI C63.4-2003

This device described above has been tested by STS, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Date of Test :

Date (s) of performance of tests Aug. 15, 2014- Aug. 21, 2014

Date of Issue Aug. 23, 2014

Test Result **Pass**

The test results of this report relate only to the tested sample identified in this report.

Testing Engineer :

(Tony Liu)

Technical Manager :

(Vita Li)

Authorized
Signatory

:

(Bovey Yang)



2. GENERAL INFORMATION

2.1 PRODUCT INFORMATION

Product	Smart thermostat
Trade Name	N/A
Model Number	TZ-PWS-02
Power Supply	DC 3.8V 700mAh by battery
Frequency Range	2405MHz -2475MHz
Modulation Type	DSSS, O-QPSK
Antenna Type:	Antenna Designation: FPCB Antenna Gain(Peak): 0.5dBi
Channel Spacing:	5MHz
Channel Number	15(CH Low: 2404MHz, CH Mid: 2440MHz, CH High: 2475MHz)
Temperature Range	-20°C ~ 50°C

NOTE:

1. Please refer to Appendix I for the photographs of the EUT. For a more detailed features description about the EUT, please refer to User's Manual.



2.2 OBJECTIVE

The objective of the report is to perform tests according to 47 CFR Part 15 Subpart C for the EUT FCC ID:

No.	Identity	Document Title
1	47 CFR Part 15(10-1-05 Edition)	Radio Frequency Devices

2.3 TEST STANDARDS AND RESULTS

Test items and the results are as bellow:

FCC Rules	Description	Result	Date of Test
FCC Part 15 C: 15.249 FCC Part 15 : 109	Radiated Emission Test	PASS	Aug 14, 2014
FCC Part 15 C: 15.207	Conducted Emission Test	N/A	N/A
FCC Part 15 C: 15.249	Band Edge Test	PASS	Aug 21, 2014
FCC Part 15 C: 15.215	20 dB Bandwidth Test	PASS	Aug 21, 2014

Note: 1. The test result judgment is decided by the limit of measurement standard
2. The information of measurement uncertainty is available upon the customer's request.
3. N/A denotes test is not applicable in this Test Report

2.4 ENVIRONMENTAL CONDITIONS

During the measurement the environmental conditions were within the listed ranges:

- Temperature: 15-35°C
- Humidity: 30-60 %
- Atmospheric pressure: 86-106 kPa



3. TEST FACILITY

3.1 TEST FACILITY

BZT Testing Technology Co., Ltd

Add.:1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street, Bao'an District, Shenzhen P.R. China.

FCC Registration No.: 701733

3.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

No.	Item	Uncertainty
1	Conducted Emission Test	$\pm 1.38\text{dB}$
3	Spurious emissions,conducted	$\pm 0.21\text{dB}$
4	All emissions,radiated(<1G)	$\pm 4.68\text{dB}$
5	All emissions,radiated(>1G)	$\pm 4.89\text{dB}$
6	Temperature	$\pm 0.5^{\circ}\text{C}$
7	Humidity	$\pm 2\%$

3.3 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

- (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)
13.36 - 13.41			

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

- (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

4. SETUP OF EQUIPMENT UNDER TEST

4.1 SUPPORT EQUIPMENT

Device Type	Brand	Model	Series No.	Note
Smart thermostat	N/A	TZ-PWS-02	N/A	

Remark:

All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

4.2 TEST EQUIPMENT LIST

Instrumentation: The following list contains equipment used at Most for testing. The equipment conforms to the CISPR 16-1 / ANSI C63.2 Specifications for Electromagnetic Interference and Field Strength Instrumentation from 10 kHz to 1.0 GHz or above.

Radiation Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Spectrum Analyzer	Agilent	E4407B	MY45108040	2014.07.06	2015.07.05	1 year
2	Test Receiver	R&S	ESPI	101318	2014.06.07	2015.06.06	1 year
3	Bilog Antenna	TESEQ	CBL6111D	31216	2014.07.06	2015.07.05	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264416	2014.06.07	2015.06.06	1 year
5	Spectrum Analyzer	ADVANTES T	R3132	150900201	2014.06.07	2015.06.06	1 year
6	Horn Antenna	EM	EM-AH-10180	2011071402	2014.07.06	2015.07.05	1 year
7	Horn Ant	Schwarzbeck	BBHA 9170	9170-181	2014.07.06	2015.07.05	1 year
8	Amplifier	EM	EM-30180	060538	2013.12.21	2014.12.21	1 year
9	Loop Antenna	ARA	PLA-1030/B	1029	2014.06.08	2015.06.07	1 year
10	Power Meter	R&S	NRVS	100696	2014.07.06	2015.07.05	1 year
11	Power Sensor	R&S	URV5-Z4	0395.1619.05	2014.07.06	2015.07.05	1 year

Conduction Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Test Receiver	R&S	ESCI	101160	2014.06.06	2015.06.05	1 year
2	LISN	R&S	ENV216	101313	2014.08.24	2015.08.23	1 year



3	LISN	EMCO	3816/2	00042990	2014.08.24	2015.08.23	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264417	2014.06.07	2015.06.06	1 year
5	Passive Voltage Probe	R&S	ESH2-Z3	100196	2014.06.07	2015.06.06	1 year
6	Absorbing clamp	R&S	MOS-21	100423	2014.06.08	2015.06.07	1 year

NOTE: Equipments listed above have been calibrated and are in the period of validation.





5. 47 CFR Part 15C 15.249 Requirements

5.1 SPURIOUS EMISSION TEST

5.1.1 REQUIREMENT

According to FCC section 15.249(a):

Except as provided in paragraph (a) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (mV/m)	Field Strength of Harmonics (μ V/m)
902-928	50	500
2400-2483.5	50	500
5725-5875	50	500
24000-24250	250	2500

According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (μ V/m)	Measurement Distance (m)
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

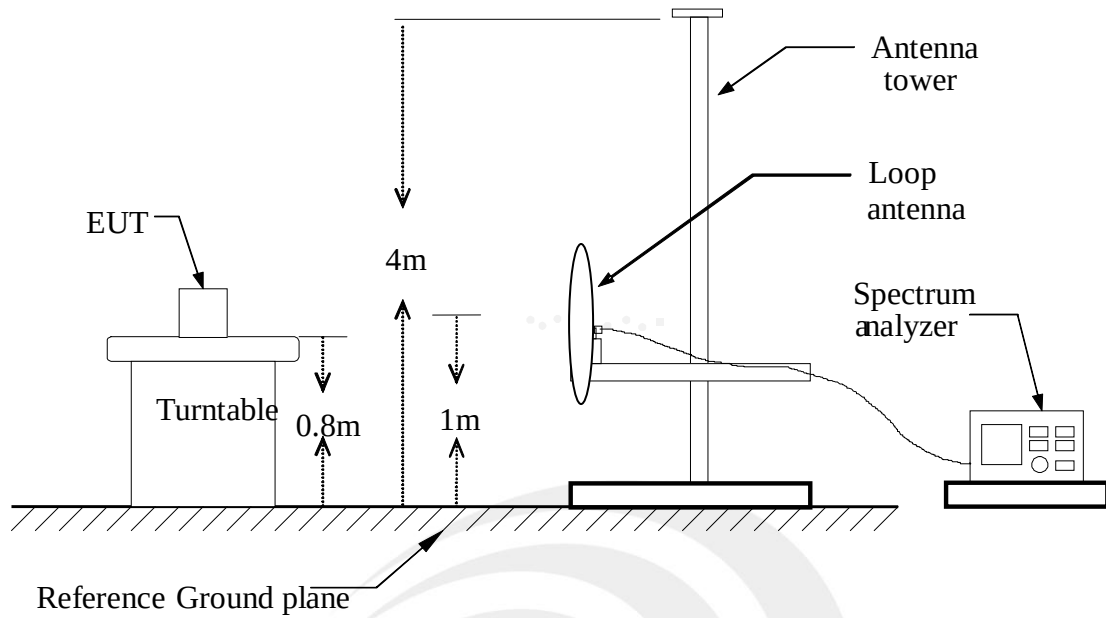
Remark: Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

In the above emission table, the tighter limit applies at the band edges.

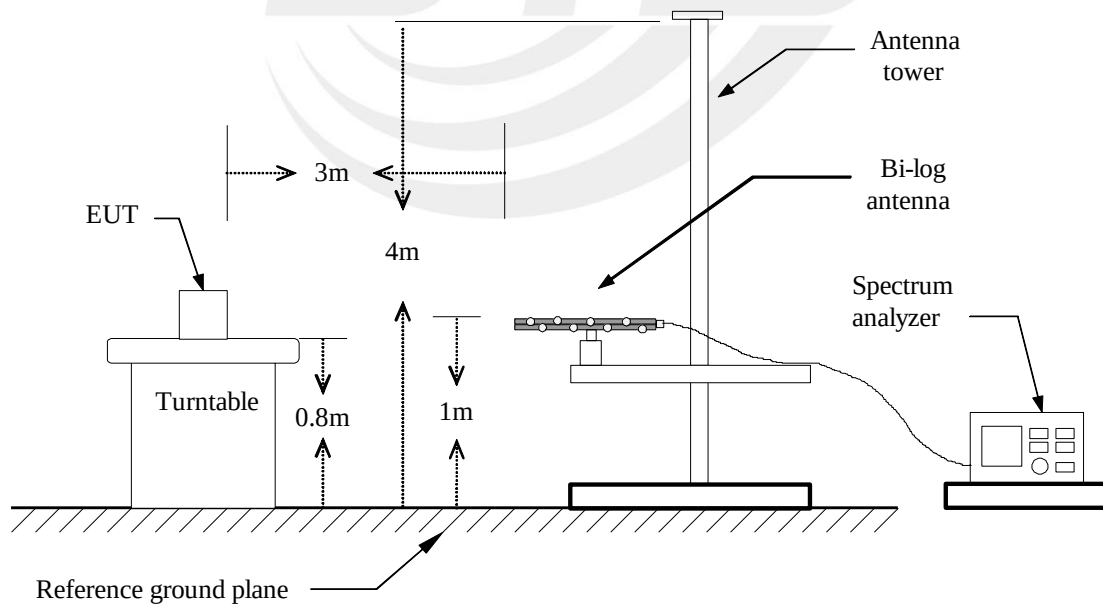
Frequency (MHz)	Field Strength (μ V/m)	Measurement Distance (m)
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

5.1.2 TEST DESCRIPTION

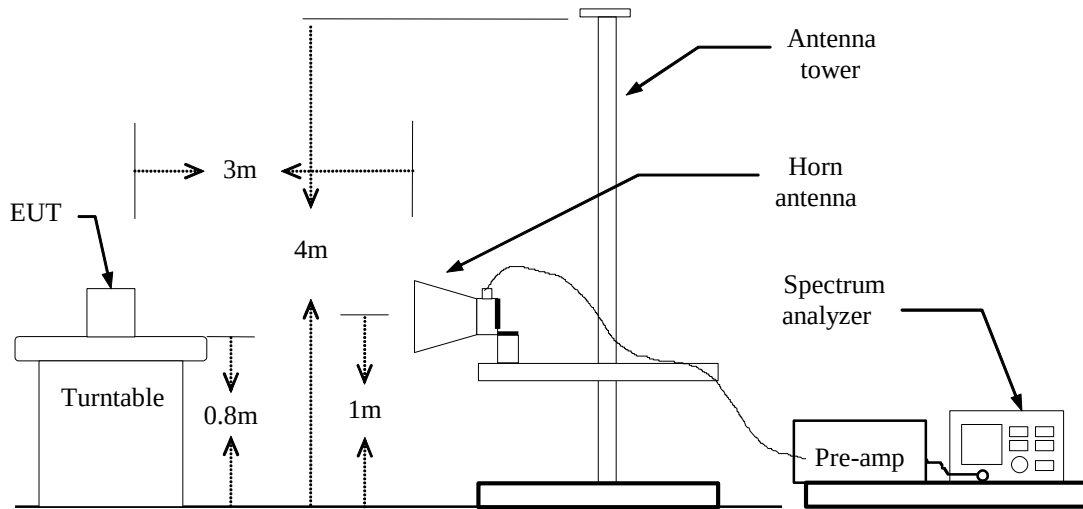
TEST SETUP:



Blow 1GHz:



Above 1GHz:



5.1.3 TEST DESCRIPTION

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Set the spectrum analyzer in the following setting as:

Below 1GHz: RBW=100 kHz / VBW=300 kHz / Sweep=AUTO

Above 1GHz :(a) PEAK: RBW=VBW=1MHz / Sweep=AUTO

(b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO

7. Repeat above procedures until the measurements for all frequencies are complete.
8. Determine the spurious emission test using the following equation:

$$CF = \text{antenna factor (dB)} + \text{Cable loss (dB)} - \text{amplifier (dB)}$$



5.1.4 TEST RESULT

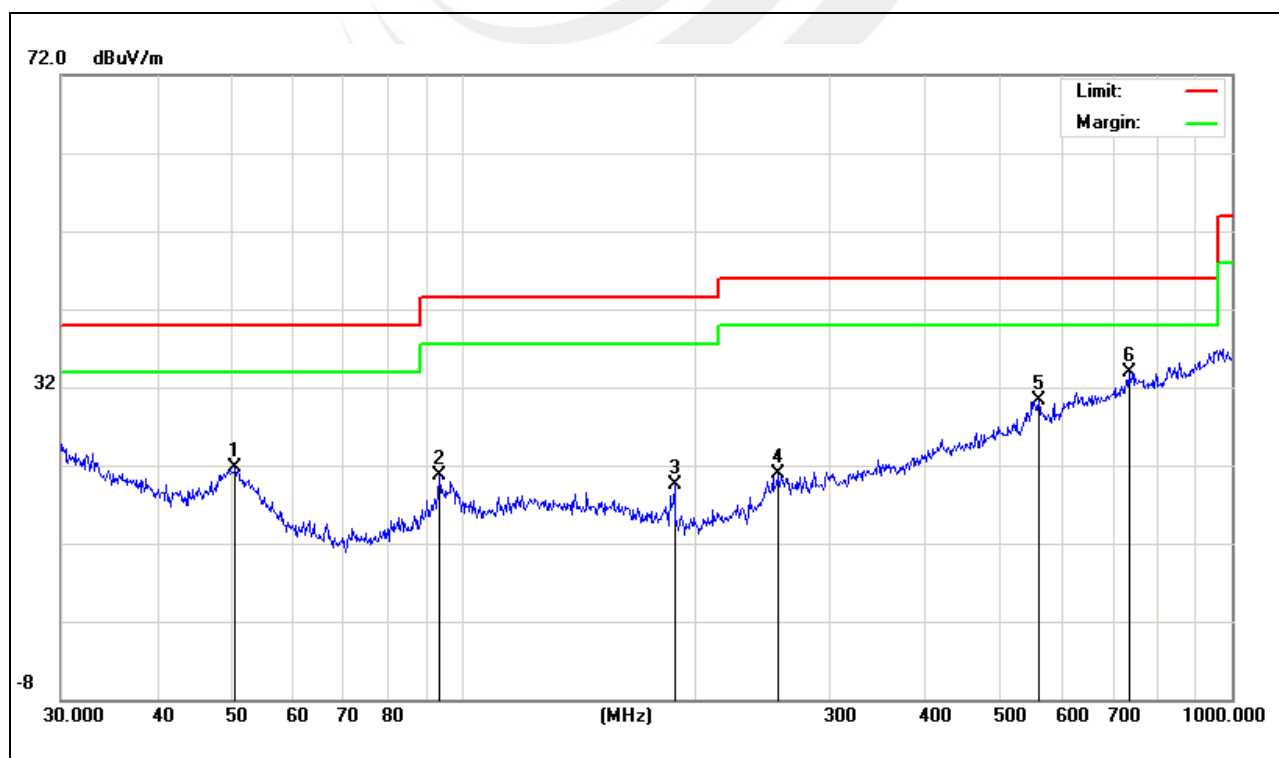
Form 30 MHz to 1GHz:

EUT :	Smart thermostat	Model Name. :	TZ-PWS-02
Temperature :	26 °C	Relative Humidity :	54%
Pressure :	1010hPa	Phase :	Horizontal
Test Voltage :	DC 3.8V By Battery	Test Mode :	Running

Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	Antenna Height
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
50.5859	13.65	7.99	21.64	40	-18.36	QP
93.1132	10.86	9.93	20.79	43.5	-22.71	QP
188.4124	10.28	9.23	19.51	43.5	-23.99	QP
256.521	6.41	14.47	20.88	46	-25.12	QP
560.6928	7.28	23.02	30.3	46	-15.7	QP
734.4913	7.45	26.36	33.81	46	-12.19	QP
560.6928	7.28	23.02	30.3	46	-15.7	QP

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.

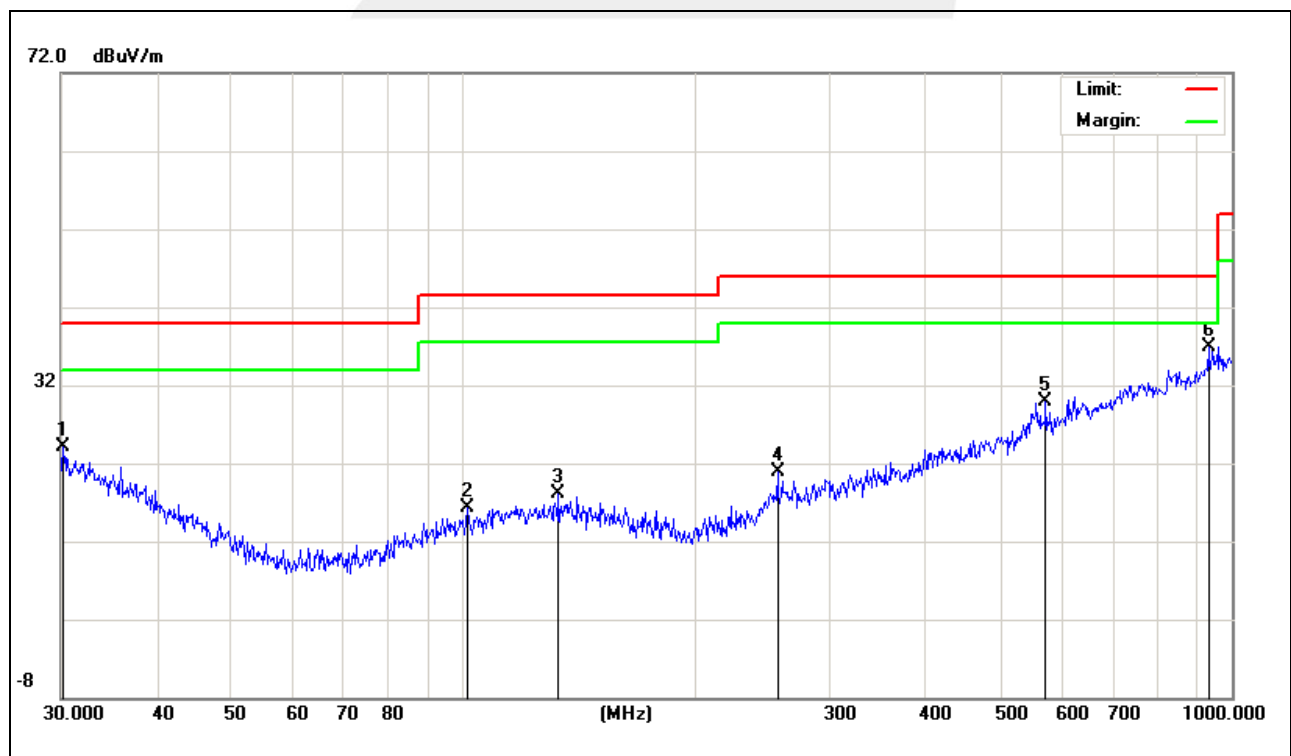


EUT :	Smart thermostat	Model Name. :	TZ-PWS-02
Temperature :	26 °C	Relative Humidity :	54%
Pressure :	1010hPa	Phase :	Vertical
Test Voltage :	DC 3.8V By Battery	Test Mode :	Running

Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	Antenna Height
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
30.211	5.89	18.23	24.12	40	-15.88	QP
101.2883	5.44	10.79	16.23	43.5	-27.27	QP
133.1511	5.82	12.23	18.05	43.5	-25.45	QP
256.521	6.41	14.47	20.88	46	-25.12	QP
572.6144	7.49	22.51	30	46	-16	QP
932.2714	7.66	29.29	36.95	46	-9.05	QP

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.



Above 1 GHz



Operation Mode: CH Low

Test Date: Aug. 14, 2014

Temperature: 20°C

Humidity: 50 % RH

Freq. (MHz)	Ant. Pol H/V	Peak	AV	Ant. / CL CF	Actual Fs		Peak	AV	Peak	AV
		Reading	Reading		Peak	AV	Limit	Limit	Margin	Margin
		(dBuV)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)	(dB)
2404.32	H	91.23	75.65	9.64	100.87	85.29	114.00	94.00	-13.13	-8.71
4808.65	H	60.65	42.41	-3.64	57.01	38.77	74.00	54.00	-16.99	-15.23
N/A									>20	>20
2404.32	V	96.34	77.42	9.62	105.96	87.04	114.00	94.00	-6.96	-6.96
4808.65	V	55.15	33.73	-3.68	51.47	30.05	74.00	54.00	-22.53	-23.95
N/A									>20	>20

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Spectrum setting:
 - a. Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = *auto*.
 - b. AV Setting 1GHz- 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = *auto*.


Operation Mode: CH Mid

Test Date: Aug. 14, 2014

Temperature: 20°C

Humidity: 50 % RH

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Peak Margin (dB)	AV Margin (dB)
					Peak (dBuV/m)	AV (dBuV/m)				
2440.14	H	94.94	75.13	9.51	104.45	84.64	114.00	94.00	-9.55	-9.36
4880.31	H	62.05	40.15	-3.60	58.45	36.55	74.00	54.00	-15.55	-17.45
N/A									>20	>20
2440.14	V	99.25	77.03	9.45	108.70	86.48	114.00	94.00	-7.52	-7.52
4880.31	V	57.85	38.28	-3.68	54.17	34.60	74.00	54.00	-19.83	-19.40
N/A									>20	>20

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Spectrum setting:
 - a. Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = *auto*.
 - b. AV Setting 1GHz- 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = *auto*.



Operation Mode: CH High

Test Date: Aug. 14, 2014

Temperature: 20°C

Humidity: 50 % RH

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Peak Margin (dB)	AV Margin (dB)
					Peak (dBuV/m)	AV (dBuV/m)				
2475.33	H	96.28	73.63	9.48	105.76	83.11	114.00	94.00	-8.24	-10.89
4950.63	H	58.85	41.66	-3.52	55.33	38.14	74.00	54.00	-18.67	-15.86
N/A									>20	>20
2475.33	V	99.25	77.03	9.42	108.67	86.45	114.00	94.00	-7.55	-7.55
4950.63	V	58.73	37.52	-3.49	55.24	34.03	74.00	54.00	-18.76	-19.97
N/A									>20	>20

Notes:

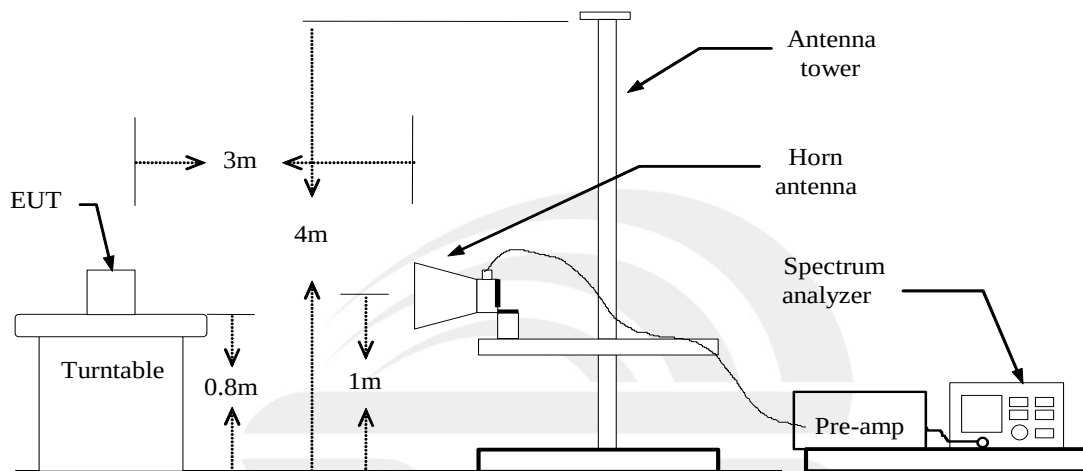
1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Spectrum setting:
 - a. Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = *auto*.
 - b. AV Setting 1GHz- 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = *auto*.

5.2 BAND EDGE

5.2.1 REQUIREMENT

According to FCC section 15.249(a), 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.

5.2.2 TEST DESCRIPTION



5.2.3 TEST RESULT

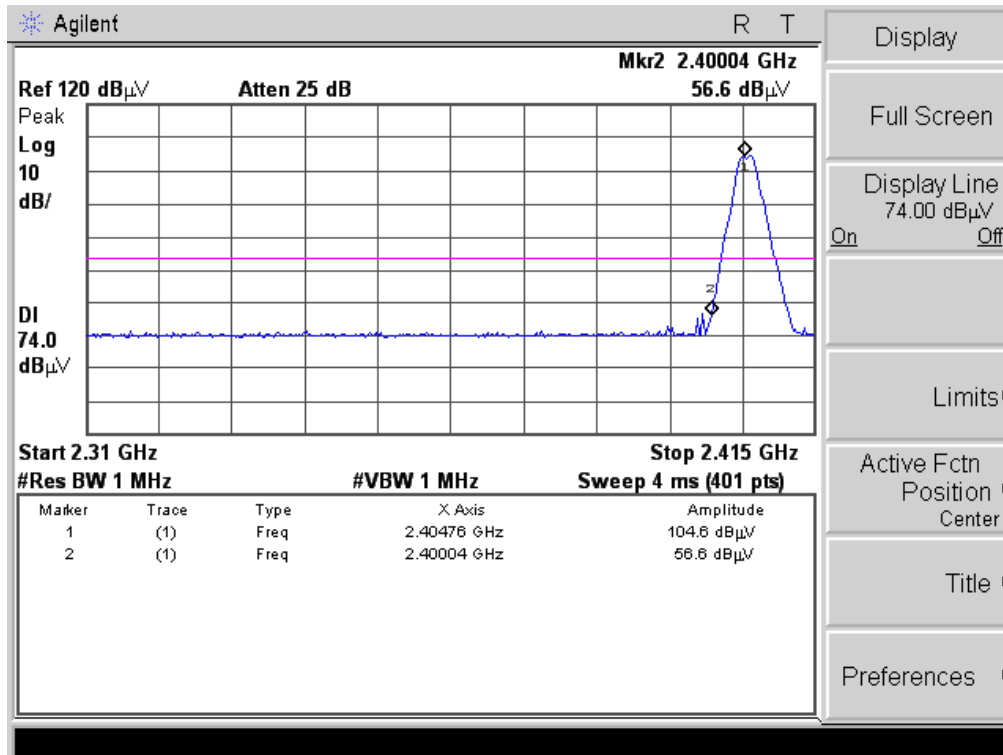
The EUT operates at hopping-off test mode. The lowest and highest channels are tested to verify the band edge emissions.

Test Channel	Frequency(MHz)	Peak Reading (dBuV)	Av Reading (dBuV)	Peak Limit (dBuV/m)	Av Limit (dBuV/m)
CH01	2405	56.6	40.99	74	54
CH15	2475	55.28	39.04	74	54

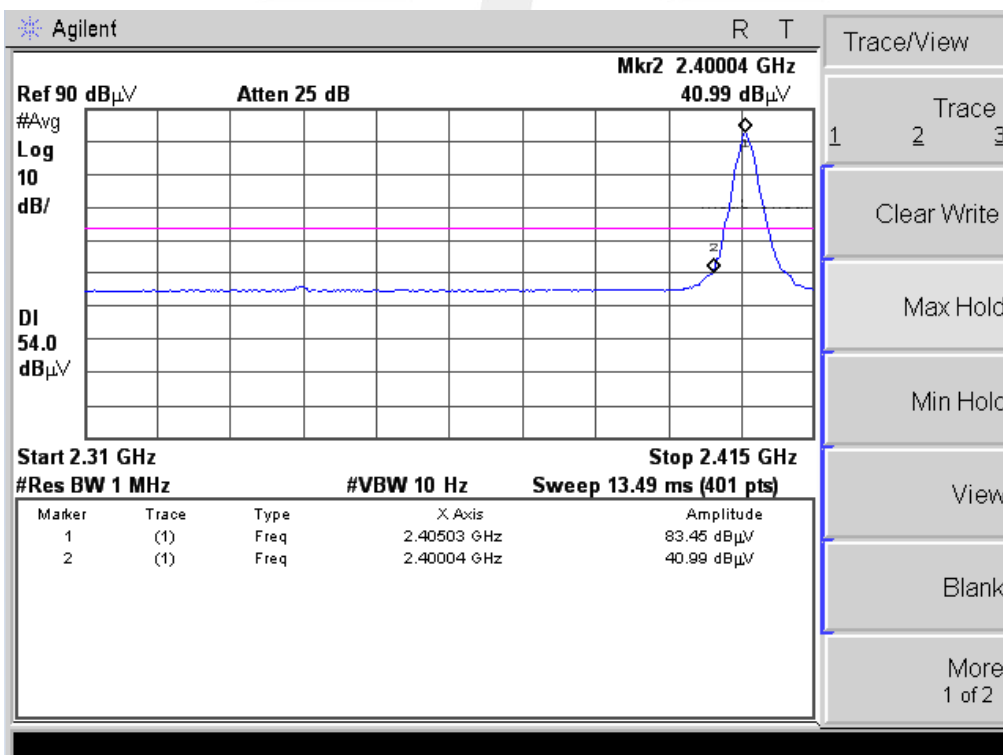
Note: 1. Every data is test both vertical and horizontal polarization and Spectrum Analyzer is max hold.



CH Low Peak

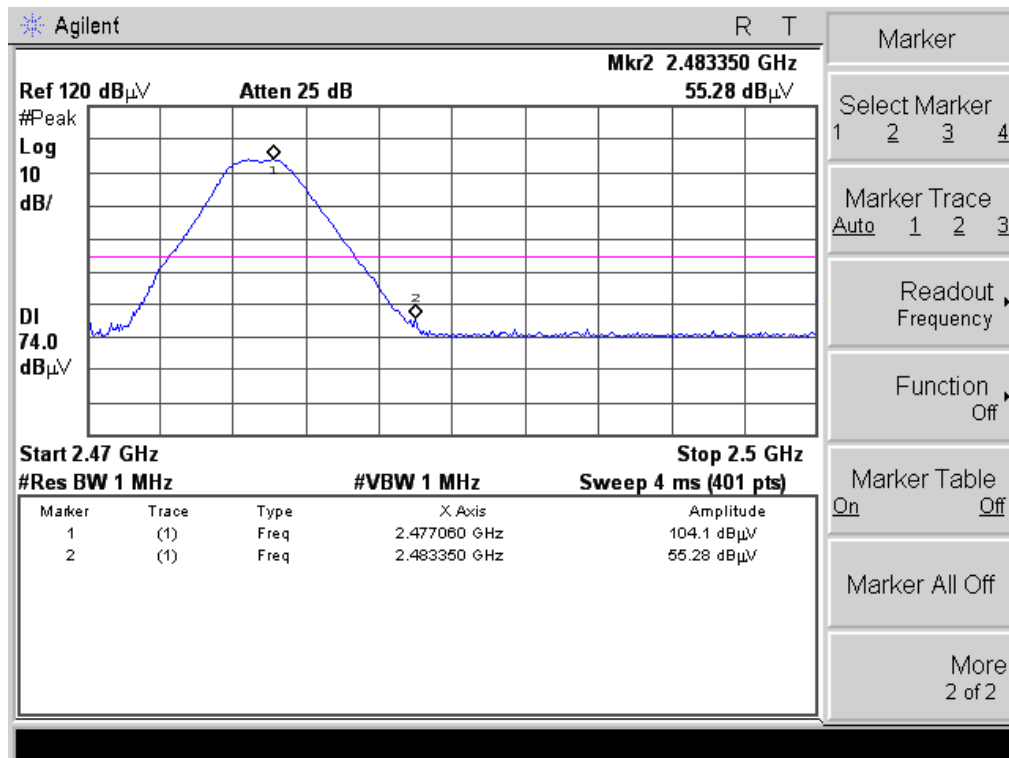


CH Low Avg

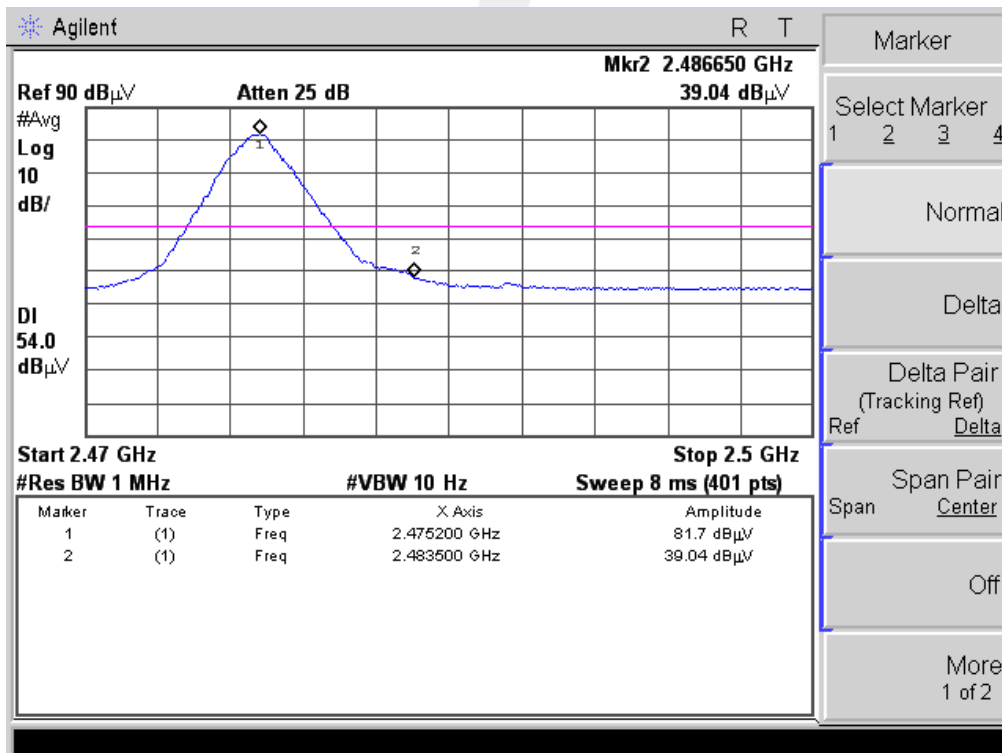




CH High Peak



CH High Avg



5.3 LINE CONDUCTED EMISSION TEST

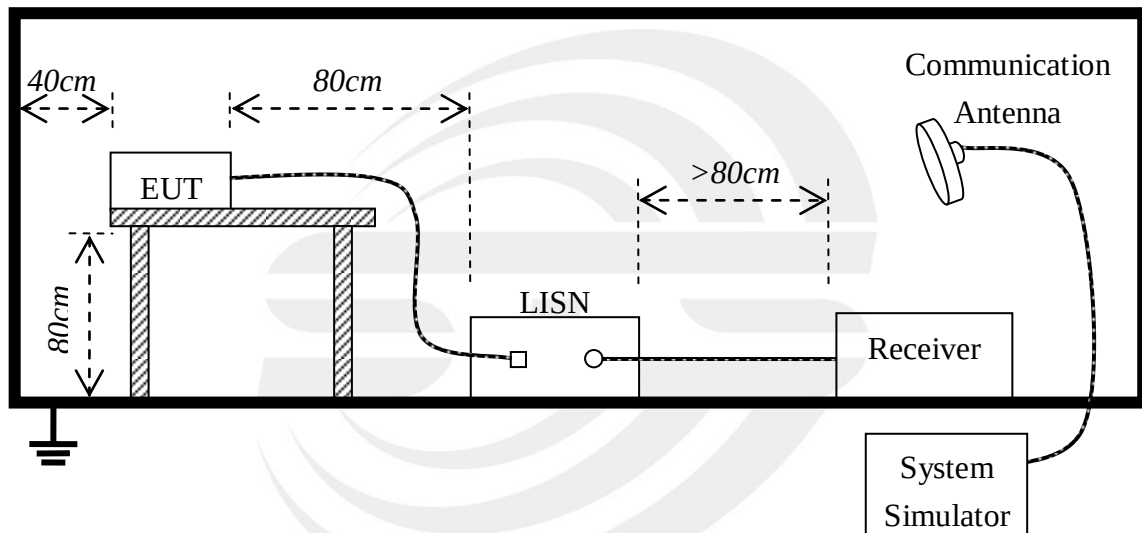
5.3.1 LIMITS OF LINE CONDUCTED EMISSION TEST

Frequency	Maximum RF Line Voltage	
	Q.P.(dBuV)	Average(dBuV)
150kHz-500kHz	66-56	56-46
500kHz-5MHz	56	46
5MHz-30MHz	60	50

****Note:** 1. the lower limit shall apply at the transition frequency.

2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz

5.3.2 BLOCK DIAGRAM OF TEST SETUP



5.3.3 PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST

- 1) The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per FCC Part 15 (see Test Facility for the dimensions of the ground plane used). When the EUT is floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
- 2) Support equipment, if needed, was placed as per FCC Part 15.
- 3) All I/O cables were positioned to simulate typical actual usage as per FCC Part 15.
- 4) The EUT received DC 5V power by AC/DC adapter which through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5) All support equipments received power from a second LISN supplying power of AC 120V/60Hz, if any.
- 6) The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7) Analyzer / Receiver scanned from 150 kHz to 30 MHz for emissions in each of the test modes.
- 8) During the above scans, the emissions were maximized by cable manipulation.

5.3.4 FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST

EUT and support equipment was set up on the test bench as per step 9 of the preliminary test.

A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less –2dB to the A.V. limit in Peak mode, then the emission signal was re-checked using Q.P and Average detector.

The test data of the worst case condition(s) was reported on the Summary Data page.

5.3.5 TEST RESULT OF LINE CONDUCTED EMISSION TEST

EUT power by battery, So EUT is not applicable in this test.

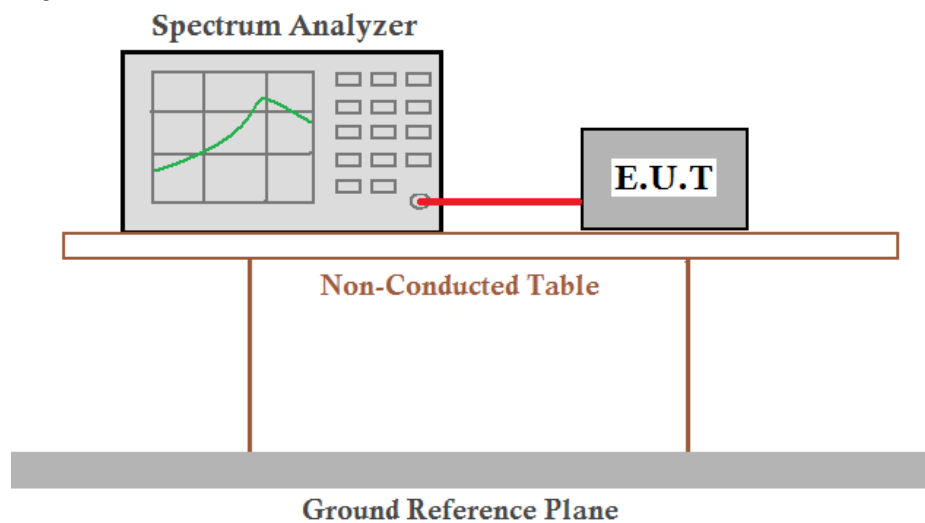


5.4 20dB Bandwidth

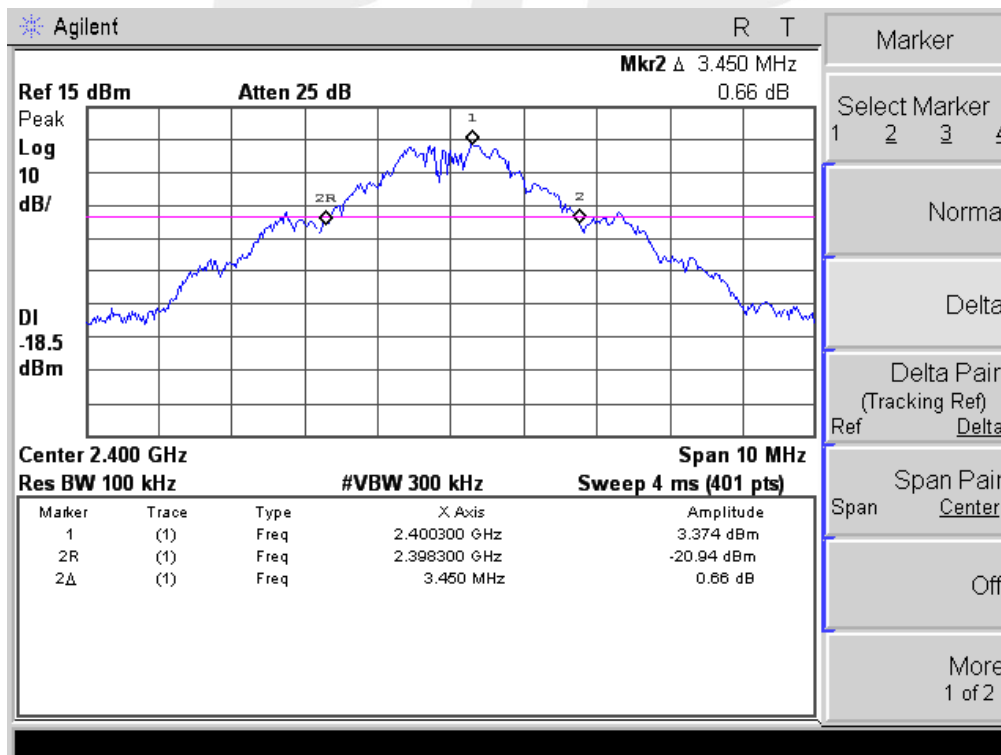
5.4.1 Definition

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

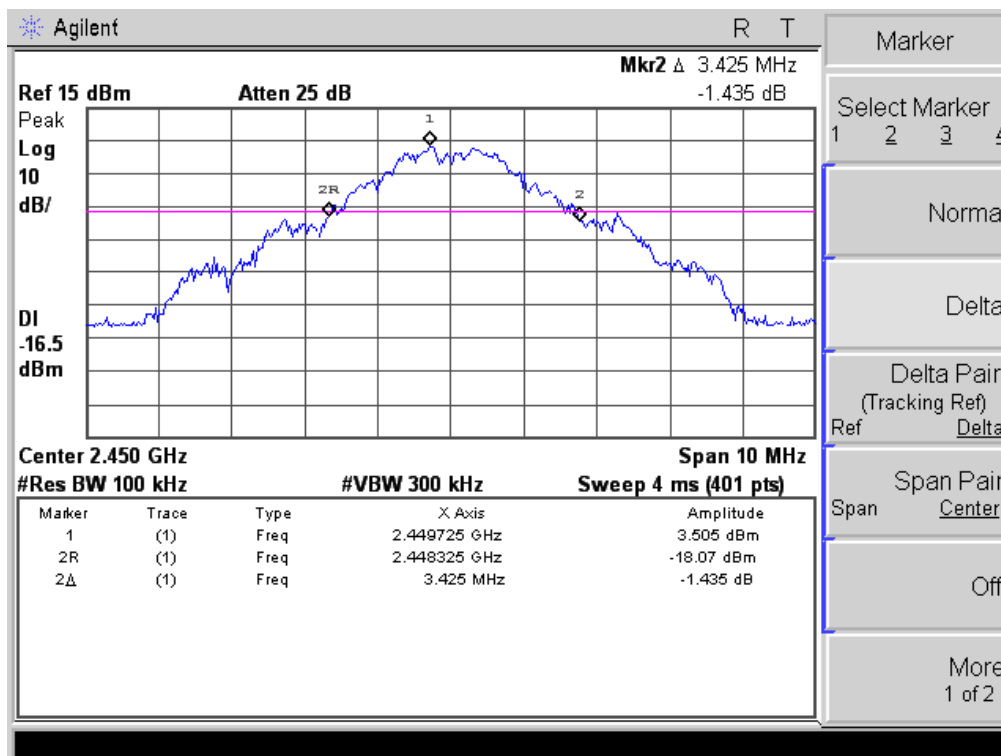
5.4.2 Test Description



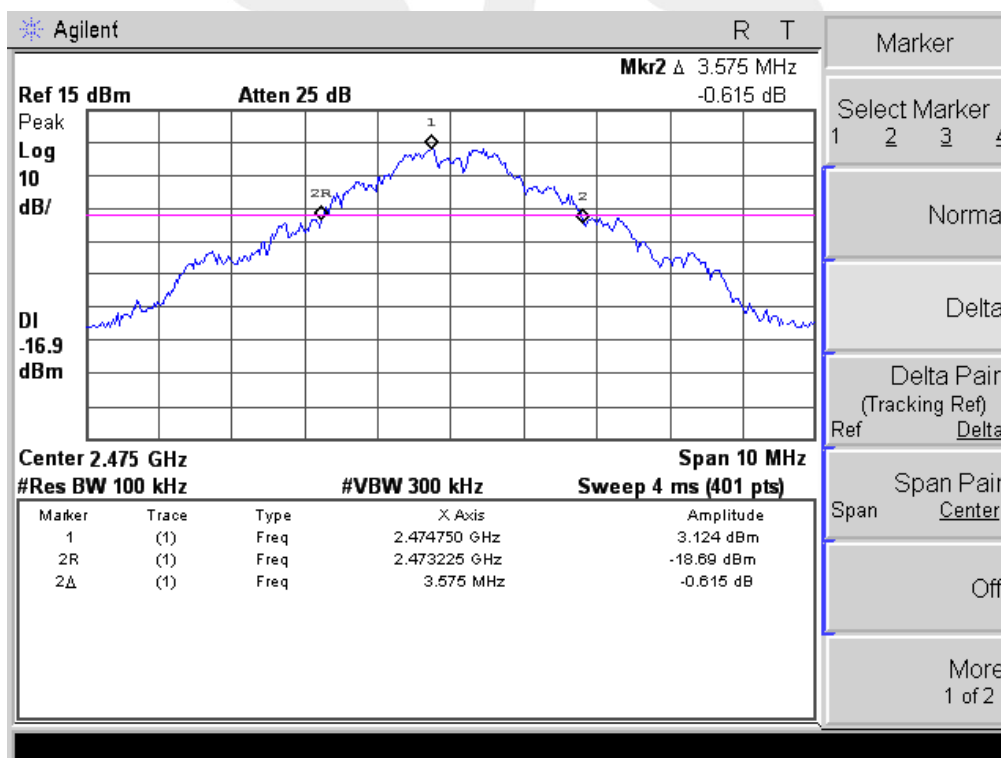
5.4.3 Test Result



(CH Low)



(CH Mid)

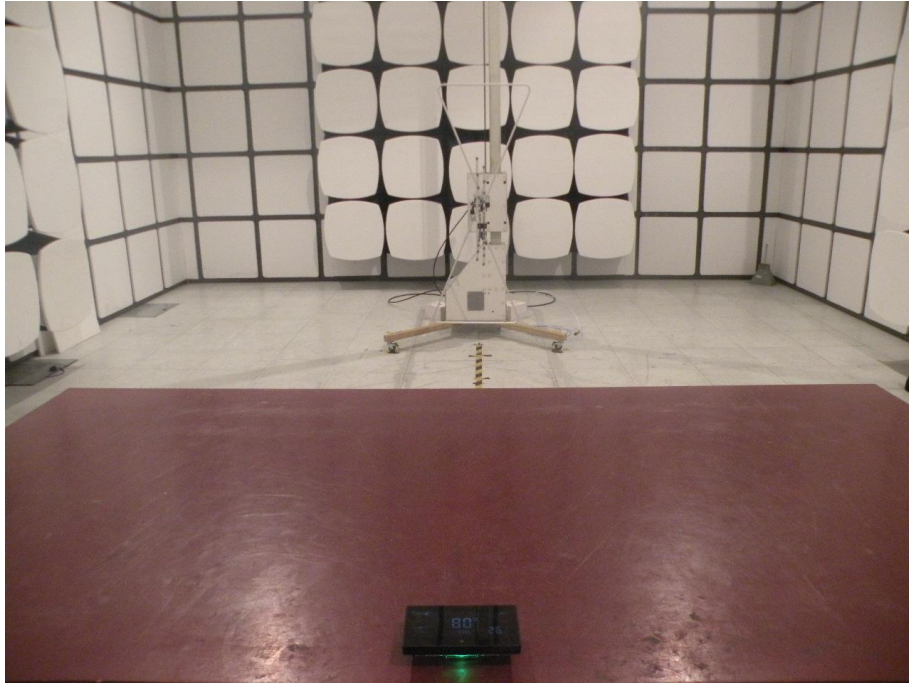


(CH High)

APPENDIX 1 PHOTOGRAPHS OF TEST SETUP

RE TEST SETUP

Below 1G



ABOVE 1G

