

EMC

TEST REPORT

Report No. : 150700432TWN-001
Model No. : T-7XI-03-C, T-7XE-05-C
HURESAC-7XI-03-C
HURESAC-7XE-05-C
Issued Date : Sep. 16, 2015

Applicant: Johnson Health Tech. Co., Ltd.
No. 999, Sec. 2, Dongda Rd., Daya Dist., Taichung City
428, Taiwan

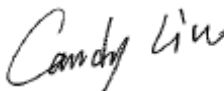
Test Method/ Standard: 47 CFR FCC Part 15.225

Registration No.: 93910

Test By: Intertek Testing Services Taiwan Ltd.
No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li,
Shiang-Shan District, Hsinchu City, Taiwan

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Revision History

Report No.	Issue Date	Revision Summary
150700432TWN-001	Sep.16, 2015	Original report

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1. Summary of Test Data

Test Requirement	Applicable Rule (Section 15.225)	Result
Fundamental emission	15.225 (a)	Pass
20 dB Bandwidth	C63.4 2003	Pass
Frequency Stability	15.225 (e)	Pass
In band Radiated Emissions	15.225(b),15.225(c)	Pass
Out of band Radiated Emissions	15.225(d)	Pass
AC Power Line Conducted Emission	15.207	Pass
Antenna Requirement	15.203	Pass

2. General Information

2.1 Identification of the EUT

Product:	Console for Exercise Machine
Model No:	T-7XI-03-C
Radio Module:	RM310
Brand Name:	Matrix Fitness
FCC ID:	TN77XIGENERATIONS
Manufacturer:	Johnson Health Tech. Co., Ltd.
Address:	No. 999, Sec. 2, Dongda Rd., Daya Dist., Taichung City 428, Taiwan
Operating Frequency:	13.56 MHz
Access scheme:	ASK
Rated Power:	DC 12 from adapter
Power Cord:	N/A
Sample Received:	Jun. 26, 2015
Sample condition:	Workable
Test Date(s):	Sep. 01, 2015 ~ Sep. 14, 2015
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Note 2:	When determining the test conclusion, the Measurement Uncertainty of test has been considered.

2.2 Description of EUT

The EUT transmit 13.56MHz signal continuously while we power on the EUT.

The customer confirmed the models listed as below were series model to model T-7XI-03C (EUT), the difference between main model and series model are listed as below.

Trade Name	Model Number	Different
Matrix Fitness	T-7XI-03-C	18.5" Touch screen LCD
	T-7XE-05-C	15.6" Touch screen LCD
	HURESAC-7XI-03-C	15.6" Touch screen LCD
	HURESAC-7XE-05-C	15.6" Touch screen LCD

Product SW version : GUI 1.0 、 i/o 1.0 、 OS 1.0
Product HW version : 40EB
Radio SW version : 3.1.1.0
Radio HW version : 3.0

For more detail features, please refer to User's manual as file name "Installation guide.pdf"

2.3 Antenna description

The antenna is affixed to the EUT using a unique connector, which allows for replacement of a broken antenna, but DOES NOT use a standard antenna jack or electrical connector.

Antenna Type : Loop Antenna
Connector Type : I-PEX

2.4 Peripherals equipment

Peripherals	Brand	Model No.	Serial No.	Data cable
Adapter	N/A	LSE0107A1240	N/A	N/A

3. Fundamental emission

3.1 Operating environment

Temperature:	25	°C
Relative Humidity:	55	%
Atmospheric Pressure	1008	hPa
Requirement & Test method	15.225 (a)	

3.2 Limit for Fundamental emission

The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 uV/m(83.99 dBuV/m) at 30 meters.

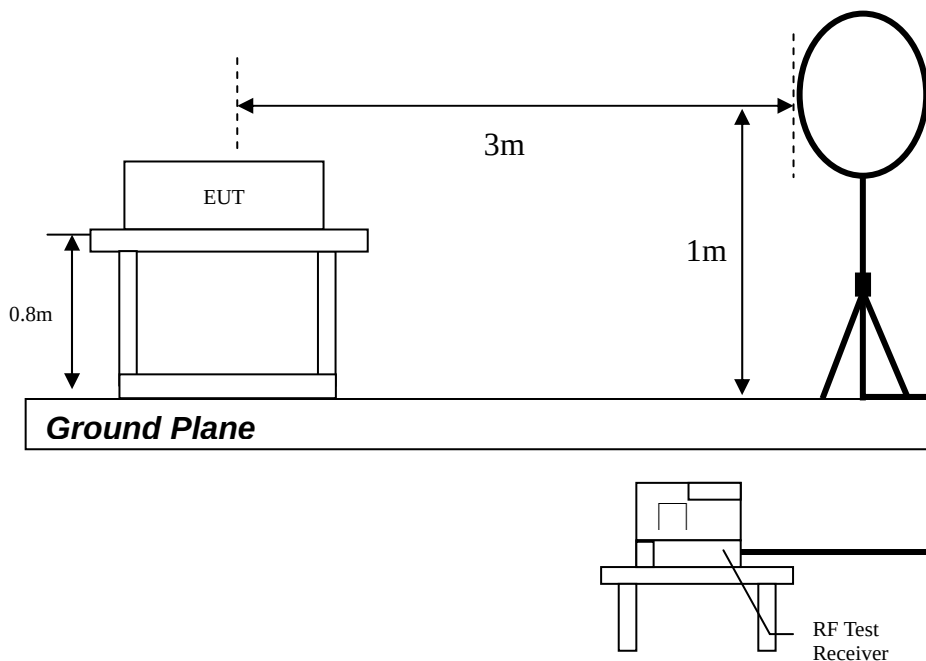
3.3 Measuring instrument setting

Spectrum analyzer settings	
Spectrum Analyzer function	Setting
Detector	QP
RBW	10 kHz
Sweep	Auto couple
Trace	Max hold
Span	900 kHz
Attenuation	Auto

3.4 Test procedure

1. Configure the EUT according to ANSI C63.10: 2013. The EUT was placed on the top of the turntable 0.8 meter above ground. The center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the companion devices. The turntable was rotated by 360 degree to find the position of the maximum emission level.
3. The height of the receiving antenna was one meter above ground to find the maximum emission field strength of the both plane and coaxial polarity
4. Set the test-receiver system to peak or CISPR quasi-peak detector with specified bandwidth under maximum hold mode.

3.5 Test diagram



3.6 Test result

Model: T-7XI-03-C

Polarity (circle)	Frequency (MHz)	Detection value	factor (dB/m)	Reading (dBμV)	value (dBμV/m)	Limit @ 3m (dBμV/m)	Tolerance (dB)
Plane	13.56	QP	22.27	40.70	62.97	124.00	-61.03

13.56MHz , Limit= 84dBuV +40 dB (decade) = 124 dB

4. 20 dB Bandwidth

4.1 Operating environment

Temperature:	25	°C
Relative Humidity:	55	%
Atmospheric Pressure	1008	hPa
Requirement & Test method	ANSI C63.10: 2013	

4.2 Limit for 20 dB bandwidth

None

4.3 Measuring instrument setting

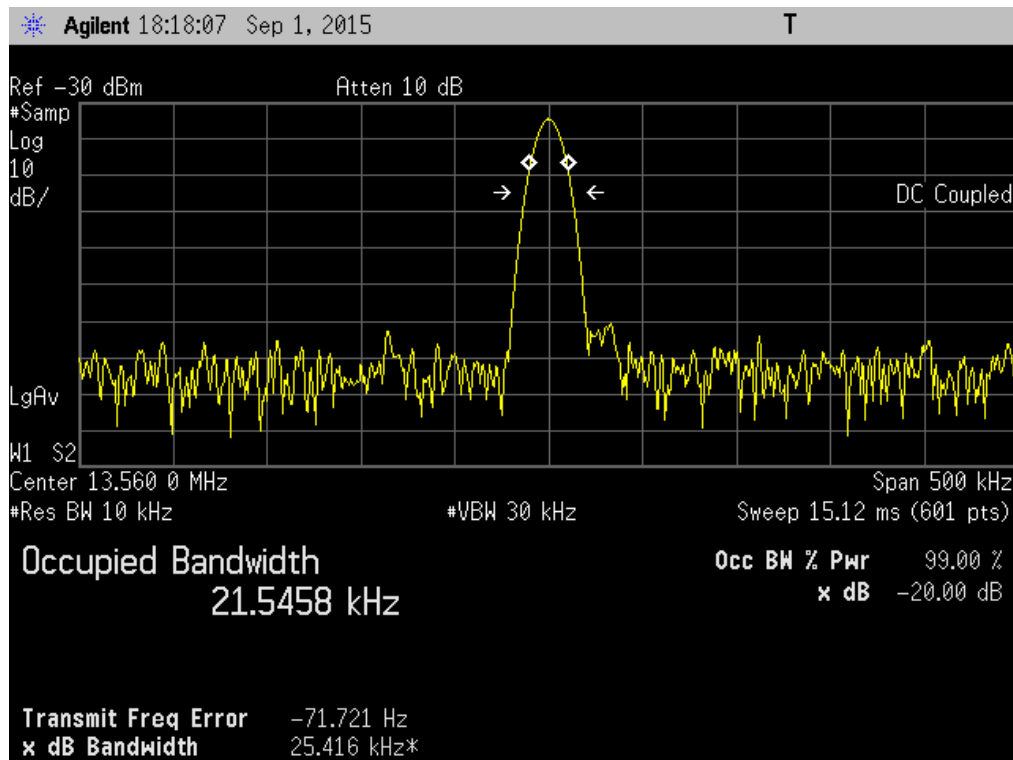
Spectrum analyzer settings	
Spectrum Analyzer function	Setting
Detector	Peak
RBW	9kHz
VBW	$\geq 3 \times \text{RBW}$
Sweep	Auto couple
Trace	Allow the trace to stabilize.
Span	≥ 1.2 times the 20 dB bandwidth
Attenuation	Auto

4.4 Test procedure

The 20 dB bandwidth was measured by spectrum analyzer connected to a receive antenna placed near the test sample while it is transmitting.

4.5 Test results

Model: T-7XI-03-C, 20dB Bandwidth: 25.416 kHz



5. Frequency Stability

5.1 Operating environment

Temperature:	25	°C
Relative Humidity:	55	%
Atmospheric Pressure	1008	hPa
Requirement & Test method	15.225(e)	

5.2 Limit for Frequency Satiability

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency over a temperature variation of -20 degrees to $+50$ degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C.

5.3 Measuring instrument setting

Spectrum analyzer settings	
Spectrum Analyzer function	Setting
Detector	Peak
RBW	9kHz
VBW	$\geq 3 \times \text{RBW}$
Sweep	Auto couple
Trace	Allow the trace to stabilize.
Span	Sufficient to see the complete emission BW
Attenuation	Auto

5.4 Test procedure

Turn the EUT on, and couple its output to a frequency counter or other frequency-measuring device of sufficient accuracy, considering the frequency tolerance with which the EUT shall comply.

5.5 Test result

Model: T-7XI-03-C

Temperature	Measuring frequency (MHz)	Voltage	Frequency
20	13.56	120Vac	13.560000
20	13.56	102Vac	13.559700
20	13.56	138Vac	13.560000

Temperature	Measuring frequency (MHz)	Voltage	Comparison frequency	Difference (MHz)	Difference (%)	Limit (%)	Result
-20	13.559700	120Vac	13.56	-0.000300	-0.002212%	±0.01	Pass
-10	13.560000	120Vac	13.56	0.000000	0.000000%	±0.01	Pass
0	13.559900	120Vac	13.56	-0.000100	-0.000737%	±0.01	Pass
10	13.560000	120Vac	13.56	0.000000	0.000000%	±0.01	Pass
20	13.560000	120Vac	13.56	0.000000	0.000000%	±0.01	Pass
30	13.559700	120Vac	13.56	-0.000300	-0.002212%	±0.01	Pass
40	13.559800	120Vac	13.56	-0.000200	-0.001475%	±0.01	Pass
50	13.559700	120Vac	13.56	-0.000300	-0.002212%	±0.01	Pass

6. In band Radiated Emissions

6.1 Operating environment

Temperature:	25	°C
Relative Humidity:	55	%
Atmospheric Pressure	1008	hPa
Requirement	15.225(b),15.225(c)	

6.2 Limit for emissions in non-restricted frequency bands

Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

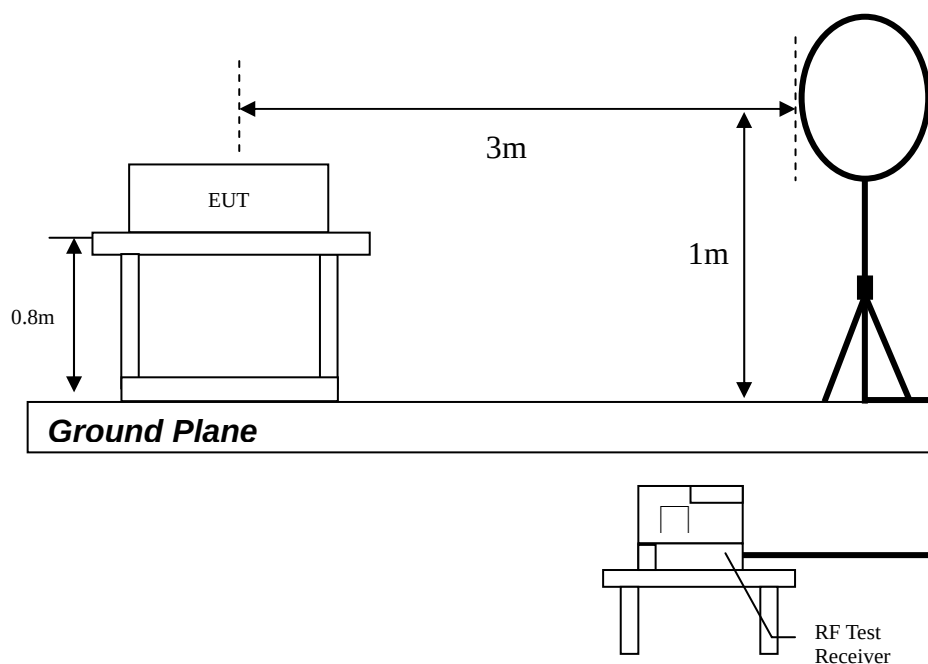
6.3 Measuring instruments setting

Spectrum analyzer settings	
Spectrum Analyzer function	Setting
Detector	QP
RBW	10 kHz
Sweep	Auto couple
Trace	Max hold
Span	900 kHz
Attenuation	Auto

6.4 Test procedure

1. Configure the EUT according to ANSI C63.10:2013. The EUT was placed on the top of the turntable 0.8 meter above ground. The center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the companion devices. The turntable was rotated by 360 degree to find the position of the maximum emission level.
3. The height of the receiving antenna is one meter above ground to find the maximum emission field strength of the both plane and coaxial polarity
4. Set the test-receiver system to peak or CISPR quasi-peak detector with specified bandwidth under maximum hold mode.

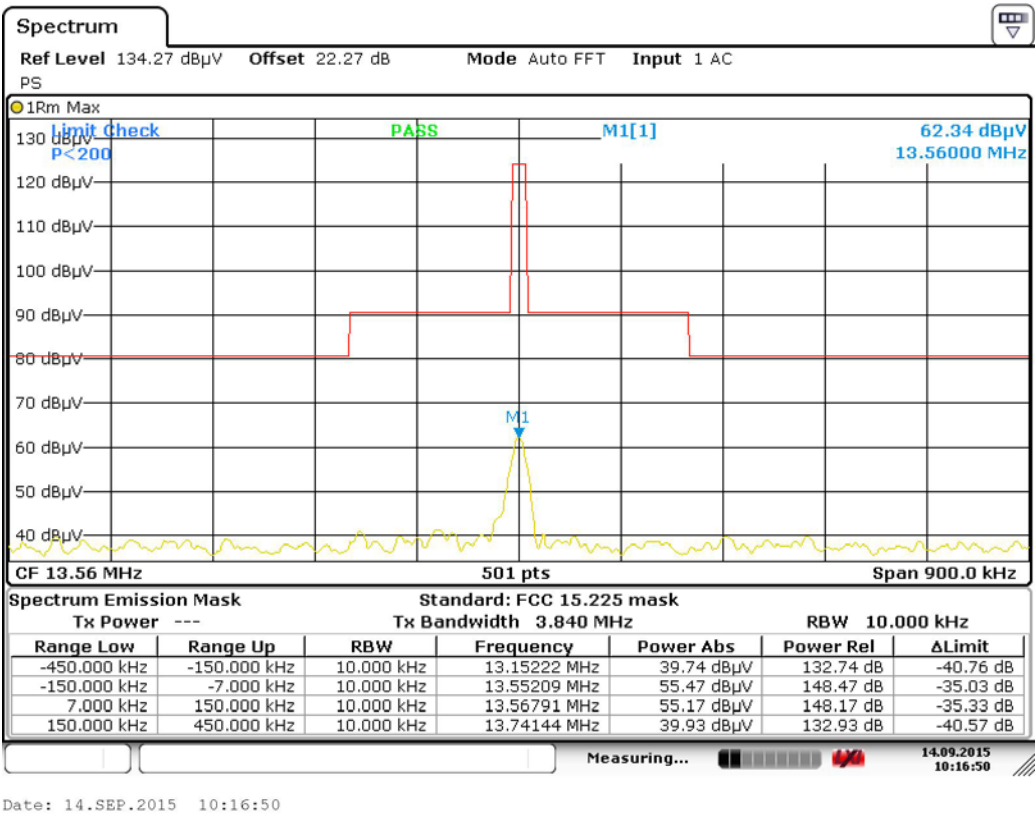
6.5 Test diagram



6.6 Test results

Worst case: Planar Polarity

Model: T-7XI-03-C



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7. Out of band Radiated Emissions

7.1 Operating environment

Temperature:	25	°C
Relative Humidity:	55	%
Atmospheric Pressure	1008	hPa
Requirement	15.225(d), 15.205, 15.209	

7.2 Limit for emission in restricted frequency bands (Radiated emission measurement)

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement distance (meters)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	2400/F(kHz)	30
1.705~30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark:

1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

7.3 Measuring instrument setting

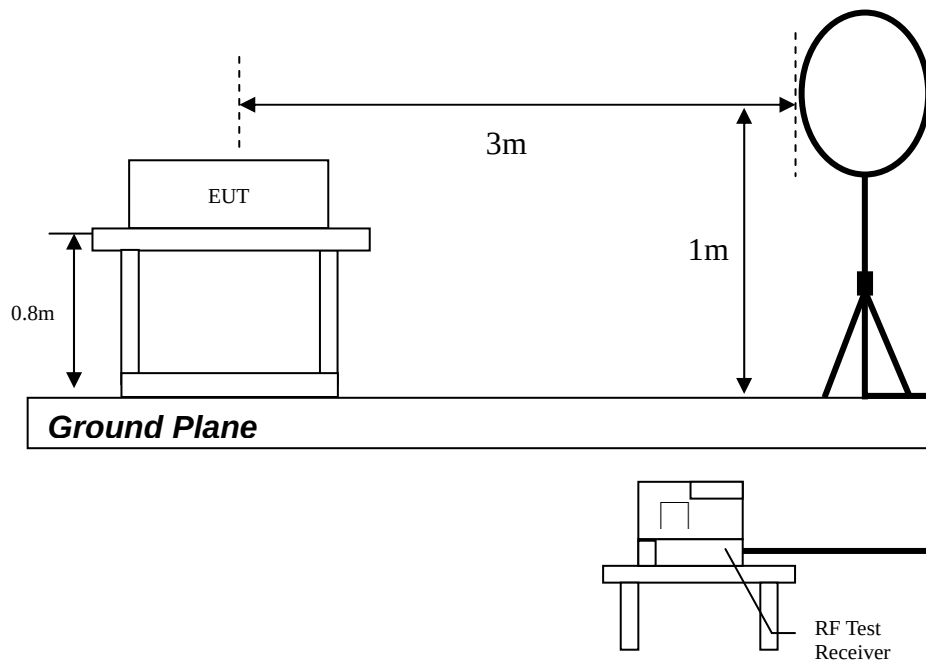
Receiver settings	
Receiver function	Setting
Detector	QP
RBW	9-150 kHz ; 200-300 Hz 0.15-30 MHz; 9-10 kHz 30-1000 MHz; 100-120 kHz
VBW	$\geq 3 \times \text{RBW}$
Sweep	Auto couple
Attenuation	Auto

7.4 Test procedure

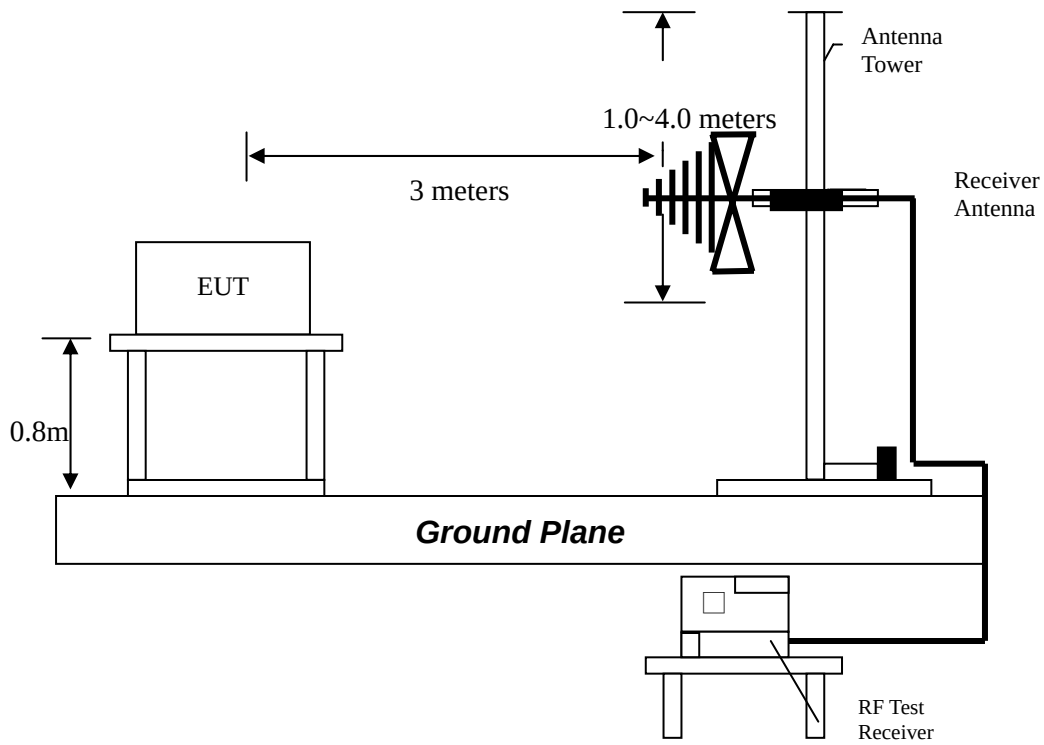
1. Configure the EUT according to ANSI C63.10:2013. The EUT was placed on the top of the turntable 0.8 meter above ground. The center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the companion devices. The turntable was rotated by 360 degree to find the position of the maximum emission level.
3. The height of the receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of the both horizontal and vertical polarization
4. If find the frequencies above the limit or below within 3dB, the antenna tower was scan (from 1m to 4m) and then the turntable was rotated to find the maximum reading.
5. Set the test-receiver system to peak or CISPR quasi-peak detector with specified bandwidth under maximum hold mode.
6. If the emissions level of the EUT in peak mode was 3dB lower than the average limit specified then testing will be stopped and peak values of the EUT will be reported. Otherwise, the emissions which do not have 3dB margin will be measured using the quasi-peak method for below 1GHz.
7. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be quasi-peak measured by receiver.

7.5 Test configuration

7.5.1 Radiated emission from 9kHz to 30MHz uses Loop Antenna:



7.5.2 Radiated emission below 1GHz using Bilog Antenna



7.6 Test result

7.6.1 Measurement results: frequencies below 30 MHz

The test was performed on EUT under continuously transmitting mode.

EUT : T-7XI-03-C
Worst Case : Tx mode

Polarity (circle)	Frequency (MHz)	Detection value	factor (dB/m)	Reading (dBμV)	value (dBμV/m)	Limit @ 3m (dBμV/m)	Tolerance (dB)
Plane	0.02	QP	20.92	24.77	45.69	200.00	-154.32
Plane	0.03	QP	20.86	24.21	45.07	160.00	-114.93
Plane	0.06	QP	20.82	21.11	41.93	120.00	-78.07
Plane	7.67	QP	22.25	9.39	31.64	70.00	-38.36
Plane	18.12	QP	22.21	7.61	29.82	70.00	-40.18
Plane	24.87	QP	22.19	7.17	29.36	70.00	-40.64

Remark: Corr. Factor = Antenna Factor + Cable Loss

7.6.2 Measurement results: frequencies below 1 GHz

The test was performed on EUT under continuously transmitting mode.

EUT : T-7XI-03-C
Worst Case : Tx mode

Antenna Polariz. (V/H)	Freq. (MHz)	Detection value	factor (dB/m)	Reading (dBμV)	value (dBμV/m)	Limit @ 3m (dBμV/m)	Tolerance (dB)
V	41.64	QP	16.50	2.36	18.86	40.00	-21.14
V	72.68	QP	13.82	7.89	21.71	40.00	-18.29
V	78.50	QP	12.68	8.57	21.25	40.00	-18.75
V	95.96	QP	11.05	19.02	30.07	43.50	-13.43
V	119.24	QP	13.78	3.79	17.57	43.50	-25.93
V	134.76	QP	15.44	1.17	16.61	43.50	-26.89
H	47.46	QP	16.97	-8.53	8.44	40.00	-31.56
H	72.68	QP	13.82	2.61	16.43	40.00	-23.57
H	82.38	QP	11.94	4.16	16.10	40.00	-23.90
H	95.96	QP	11.05	16.05	27.10	43.50	-16.40
H	119.24	QP	13.78	5.57	19.35	43.50	-24.15
H	134.76	QP	15.44	0.65	16.09	43.50	-27.41

Remark:

1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor

Note: The amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value has no need to be reported.

8. AC Power Line Conducted Emission

8.1 Operating environment

Temperature:	20	°C
Relative Humidity:	58	%
Atmospheric Pressure	1009	hPa
Requirement	15.207	

8.2 Limit for AC power line conducted emission

Freq. (MHz)	Conducted Limit (dBuV)	
	Q.P.	Ave.
0.15~0.50	66 – 56*	56 – 46*
0.50~5.00	56	46
5.00~30.0	60	50

8.3 Measuring instrument setting

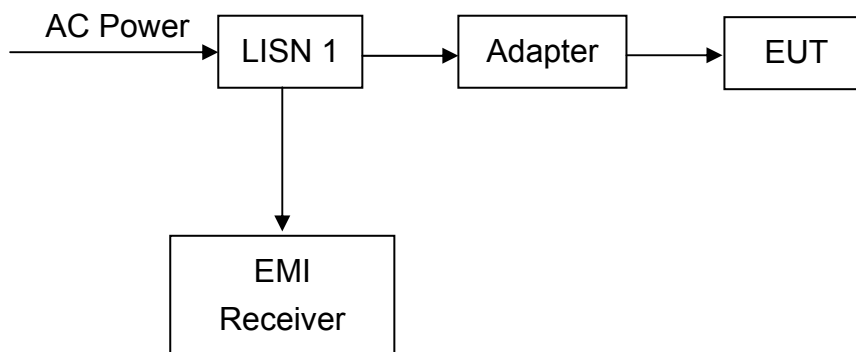
Receiver settings	
Receiver function	Setting
Detector	QP
Start frequency	0.15MHz
Stop frequency	30MHz
IF bandwidth	9 kHz
Attenuation	10dB

8.4 Test procedure

1. Configure the EUT according to ANSI C63.10:2013. The EUT or host of EHT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT or host of EUT to the power mains through a line impedance stabilization network.

3. All the companion devices are connected to the other LISN. The LISN should provide 50uH/50ohms coupling impedance.
4. The frequency range from 150 kHz to 30MHz was searched
5. Set the test-receiver system to peak detector and specified bandwidth with maximum hold mode.
6. The measurement has to be done between each power line and ground at the power terminal.

8.5 Test diagram



Note: The EUT was tested in normal communication mode.

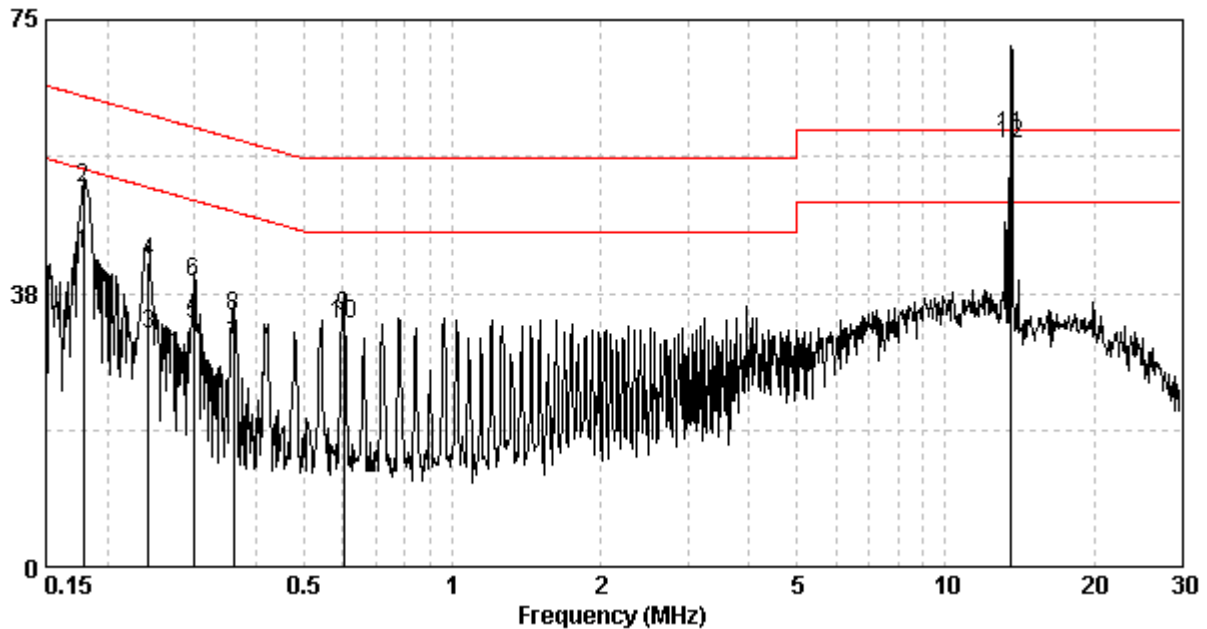
8.6 Test results

Phase : Line
EUT : T-7XI-03-C
Test Condition : TX mode

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level Av (dBuV)	Limit Av (dBuV)	Margin (dB) Qp	Av
0.179	9.74	51.98	64.55	42.82	54.55	-12.57	-11.72
0.242	9.74	41.67	62.04	32.00	52.04	-20.37	-20.04
0.299	9.73	39.02	60.28	33.14	50.28	-21.26	-17.14
0.360	9.73	34.45	58.74	30.24	48.74	-24.29	-18.50
0.601	9.76	34.45	56.00	33.27	46.00	-21.55	-12.73
13.551	9.89	58.98	60.00	57.92	50.00	-1.02	7.92

Remark:

1. Corr. Factor (dB) = LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)

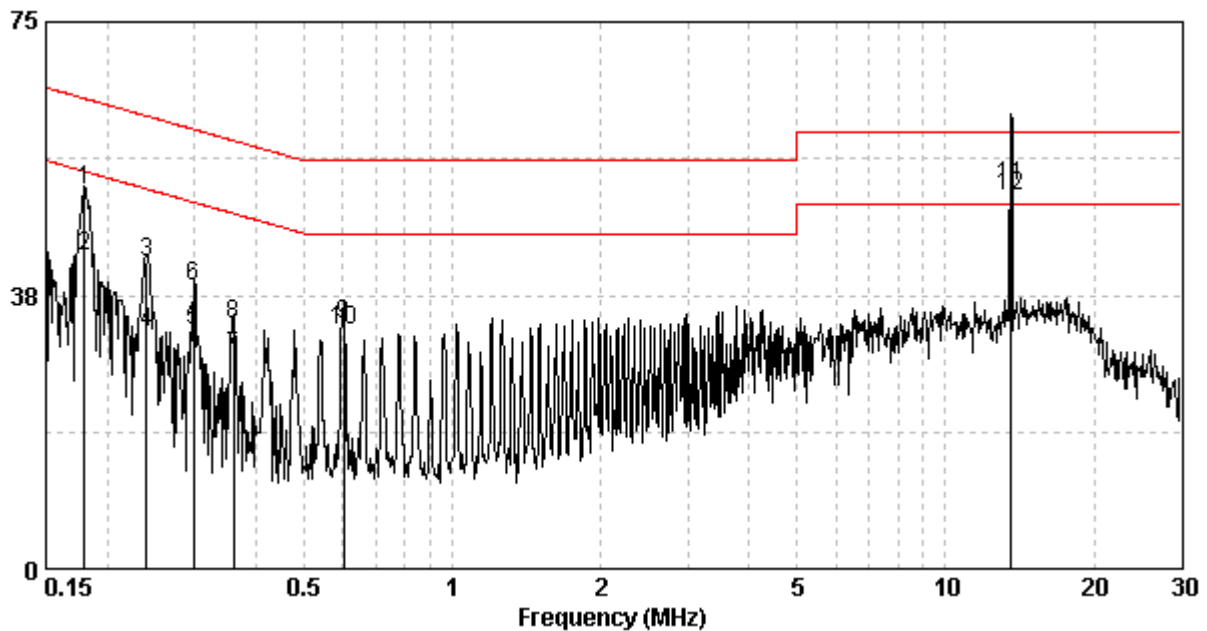


Phase : Neutral
EUT : T-7XI-03-C
Test Condition : TX mode

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level Av (dBuV)	Limit Av (dBuV)	Margin (dB) Qp	Av
0.180	9.74	51.91	64.50	42.93	54.50	-12.59	-11.57
0.240	9.74	42.12	62.08	32.51	52.08	-19.96	-19.57
0.299	9.73	38.84	60.28	32.64	50.28	-21.44	-17.64
0.360	9.73	33.41	58.74	29.21	48.74	-25.33	-19.53
0.601	9.76	33.51	56.00	32.61	46.00	-22.49	-13.39
13.551	9.95	52.48	60.00	50.96	50.00	-7.52	0.96

Remark:

1. Corr. Factor (dB) = LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)

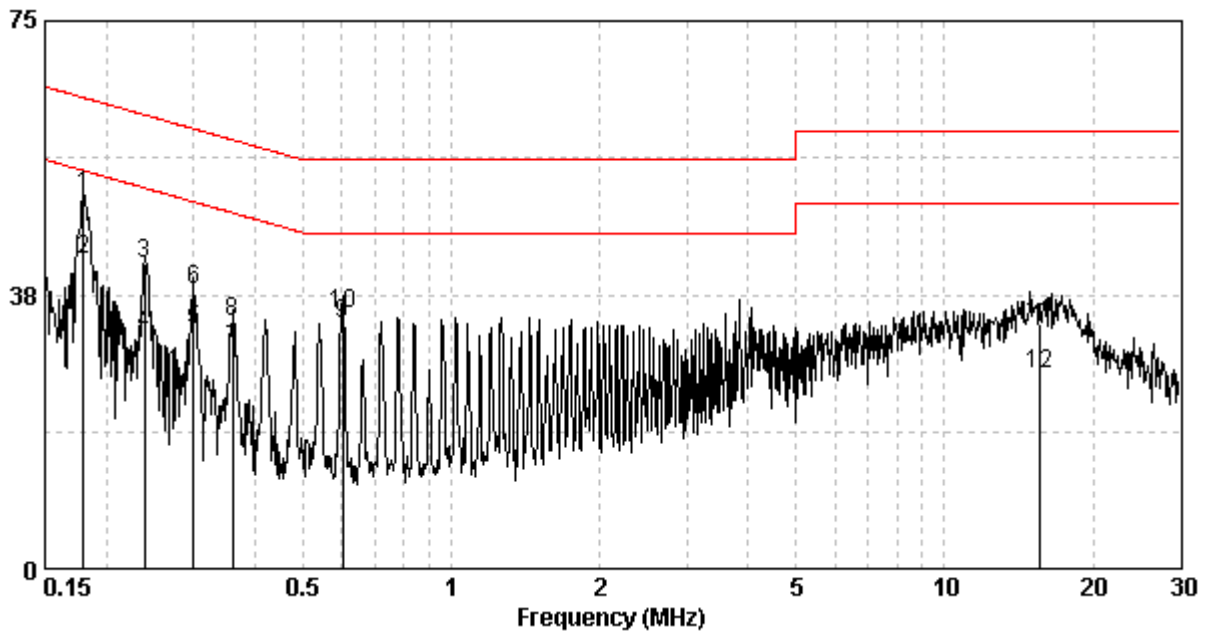


Phase : Line
EUT : T-7XI-03-C
Test Condition : NFC Antenna Termination

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level Av (dBuV)	Limit Av (dBuV)	Margin (dB) Qp	Av
0.180	9.74	51.09	64.50	42.20	54.50	-13.41	-12.31
0.239	9.74	41.75	62.13	32.12	52.13	-20.38	-20.01
0.300	9.73	38.21	60.24	32.72	50.24	-22.02	-17.52
0.360	9.73	33.81	58.74	29.96	48.74	-24.93	-18.77
0.601	9.76	34.91	56.00	33.65	46.00	-21.09	-12.35
15.600	9.88	33.57	60.00	26.70	50.00	-26.43	-23.30

Remark:

1. Corr. Factor (dB) = LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)

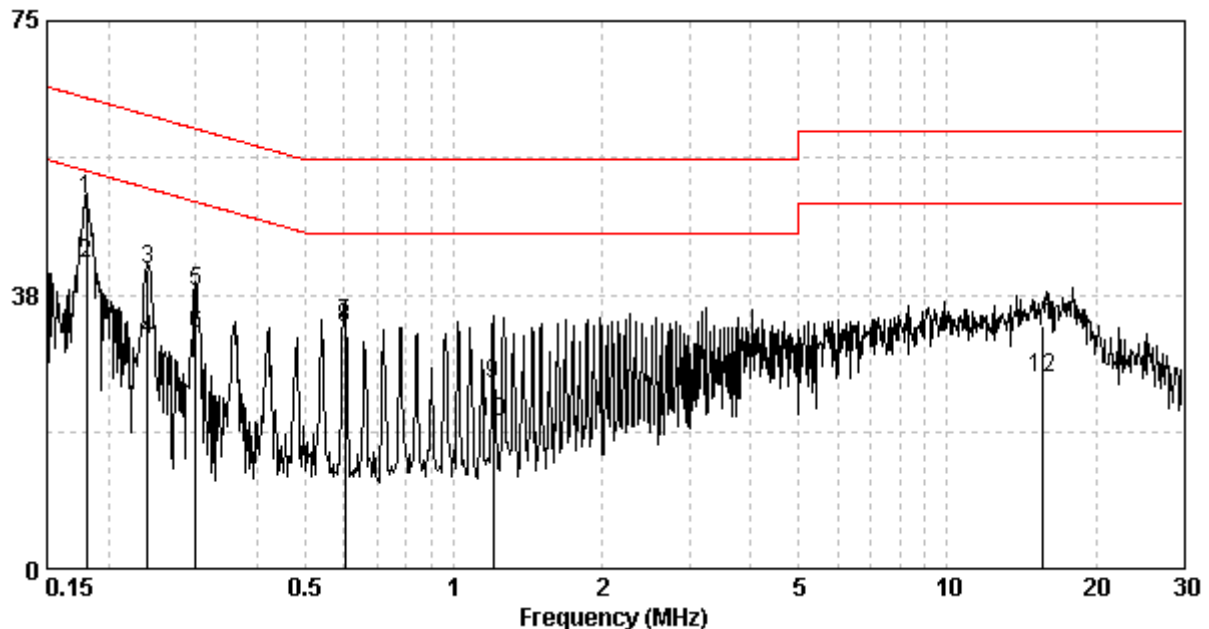


Phase : Neutral
EUT : T-7XI-03-C
Test Condition : NFC Antenna Termination

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level Av (dBuV)	Limit Av (dBuV)	Margin (dB) Qp	Av
0.181	9.74	50.45	64.46	41.72	54.46	-14.01	-12.74
0.240	9.74	40.91	62.08	31.40	52.08	-21.18	-20.69
0.300	9.73	37.98	60.24	32.13	50.24	-22.26	-18.10
0.601	9.76	33.59	56.00	33.05	46.00	-22.41	-12.95
1.203	9.84	25.32	56.00	20.01	46.00	-30.68	-25.99
15.600	9.96	33.14	60.00	26.22	50.00	-26.86	-23.78

Remark:

1. Corr. Factor (dB) = LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)



9. Antenna Requirement

9.1 Limit for Antenna Requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

9.2 Test results

The sample tested met the antenna requirement. The antenna was a Loop Antenna attached to the circuit board by a Specific cable.

Appendix A: Test equipment list

Equipment	Brand	Model No.	Serial No.	Calibration Date	Next Calibration Date
ESCI EMI Test Receiver	Rohde & Schwarz	ESCI	100018	2014/12/02	2015/12/01
Spectrum Analyzer	Rohde & Schwarz	FSP30	100137	2015/08/18	2016/08/16
Spectrum Analyzer	Rohde & Schwarz	FSEK30	100186	2015/01/14	2016/01/13
Broadband Antenna	Schwarzbeck	VULB 9168	9168-172	2013/08/08	2016/08/06
Temperature&Humidity Test Chamber	TERCHY	MHU-225LRU (SA)	950838	2015/06/09	2016/06/07
Two-Line V-Network	Rohde & Schwarz	ESH3-Z5	838979/014	2014/10/05	2015/10/04
Singal Analyzer	Agilent	N9030A	MY51380492	2014/09/19	2015/09/18
Active Loop Antenna	SCHWARZBECK MESS-ELEKTRONIC	FMZB1519	1519-067	2015/04/30	2016/04/28
CON-1 Cable	SUHNER	BNC / RG-58	1521946	2015/05/09	2016/05/07
EMI Test Receiver	Rohde & Schwarz	ESR-7	101232	2014/12/1	2015/11/30
PSA Spectrum Analyzer 3Hz-26.5GHz	Agilent	E4440A	MY46186191	2015/05/19	2016/05/17
966-2(A) Cable	SUHNER	SMA / EX 100	N/A	2015/05/06	2016/05/05
966-2(B) Cable	JUNFLON	SMA / J12J100880-00	AUG-26-08-002	2015/05/06	2016/05/05
RF Cable	SUHNER	SUCOFLEX 102	CB0006	2015/05/06	2016/05/05
Brand		Software		Version	
ADT		Radiated test system		7.5.14	
Audix		e3		4.2004-1-12k	

Appendix B: Measurement Uncertainty

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of $k=2$.

Item	Uncertainty
Vertically polarized radiated disturbances from 30MHz~1GHz in a semi-anechoic chamber at a distance of 3m	5.15 dB
Horizontally polarized radiated disturbances from 30MHz~1GHz in a semi-anechoic chamber at a distance of 3m	5.23 dB
Vertically polarized Radiated disturbances from 1GHz~18GHz in a semi-anechoic chamber at a distance of 3m	4.19 dB
Horizontally polarized Radiated disturbances from 1GHz~18GHz in a semi-anechoic chamber at a distance of 3m	4.3 dB
Vertically polarized Radiated disturbances from 18GHz~40GHz in a semi-anechoic chamber at a distance of 3m	4.19 dB
Horizontally polarized Radiated disturbances from 18GHz~40GHz in a semi-anechoic chamber at a distance of 3m	4.3 dB
Conducted Output power	0.86 dB
Radiated electromagnetic disturbances in the frequency range from 9kHz to 30MHz	2.92 dB
Conducted disturbance measurements at a mains port from 9 kHz to 30 MHz using a 50 Ω /50 μ H +5 Ω artificial mains network (AMN)	2.5 dB