

Johnson Health Tech. Co., Ltd.

TEST REPORT

Model:

Virtual Training-C

REPORT NUMBER

240700050THC-001

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Radio Spectrum TEST REPORT

Applicant:	Johnson Health Tech. Co., Ltd. No.999, Sec. 2, Dongda Rd., Daya Dist Taichung City 428, Taiwan
Product:	Console for Exercise Machine
Model No.:	Virtual Training-C
Brand Name:	MATRIX
FCC ID:	TN7ATHENARF-02
Test Method/ Standard:	47 CFR FCC Part 15.225
Test By:	Intertek Testing Services Taiwan Ltd., Hsinchu Laboratory No. 17, Ln. 246, Niupu S. Rd., Xiangshan Dist, Hsinchu City 300075, Taiwan



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Revision History

Report No.	Issue Date	Revision Summary
240700050THC-001	Oct. 17, 2024	Original report

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Summary of Test Data

Test Requirement	Applicable Rule (Section 15.225)	Result
Fundamental emission	15.225 (a)	Pass
Frequency Satiability	15.225 (e)	Pass
Out of band Radiated Emissions	15.225(d)	Pass
AC Power Line Conducted Emission	15.207	Pass
Antenna Requirement	15.203	Pass

Note: Please note that the test results with statement of conformity, the decision rules which are based on: Safety Testing: the specification, standard or IEC Guide 115.

Other Testing: the specification, standard and not taking into account the measurement uncertainty.

1. General Information

1.1 Identification of the EUT

Product:	Console for Exercise Machine
Model No.:	Virtual Training-C
Operating Frequency:	13.56 MHz
Rating:	DC 12V
Power Cord:	N/A
Sample receiving date:	2024/09/18
Sample condition:	Workable
Test Date(s):	2024/10/08 ~ 2024/10/09

1.2 Antenna description

Antenna Type : PCB Antenna
Connector Type : I-PEX

1.3 Operation mode

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

1.4 Peripheral equipment

Peripherals	Manufacturer	Product No.	Remark
Adapter	Tec-Motion	TC-33097	IP:100-240V~ 50-60Hz 1.5A OP:12.6V= 7.6A

2. Fundamental emission

2.1 Operating environment

Temperature (°C):	26
Relative Humidity (%):	71
Test date:	2024/10/09

2.2 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.

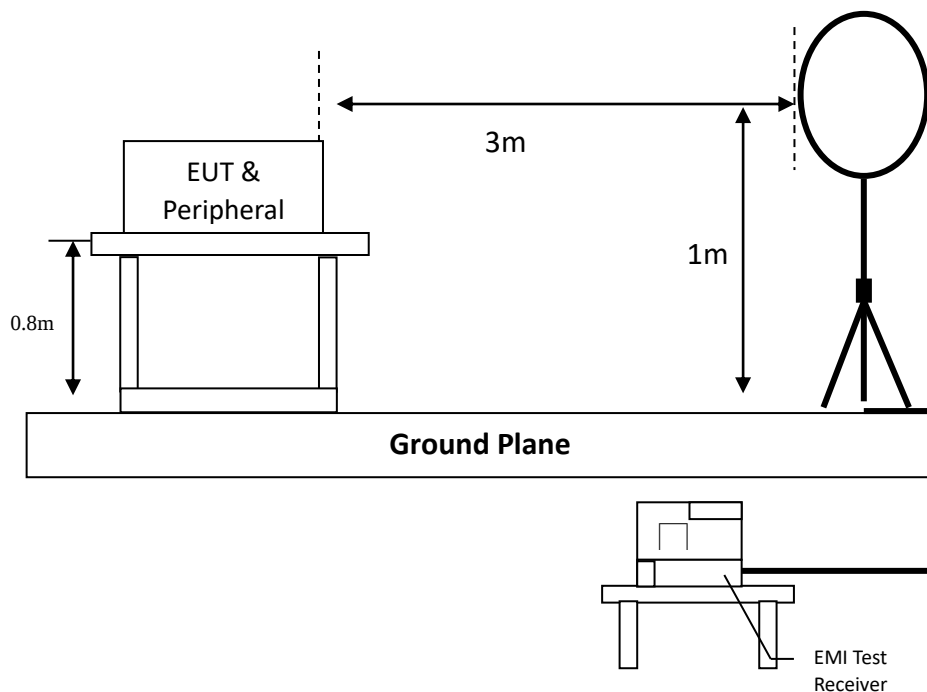
2.3 Measuring instrument setting

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

2.4 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. Set the test-receiver system to peak or CISPR quasi-peak detector with specified bandwidth under maximum hold mode.

2.5 Test diagram



2.6 Test result

Polarization	Frequency (MHz)	Spectrum Analyzer Detector	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
Perpendicular	13.56	PK	20.03	41.34	61.37	124.00	-62.63
Parallel	13.56	PK	20.03	43.22	63.25	124.00	-60.75
Ground-parallel	13.56	PK	20.03	28.96	48.99	124.00	-75.01

Remark: Corr. Factor = Antenna Factor + Cable Loss

Limit= 15848(uV/m)@30m=84 dBuV +40 dBuV (decade) = 124 dBuV/m@3m

3. Frequency Satiability

3.1 Operating environment

Temperature (°C) :	-20~50
Relative Humidity (%) :	71
Test date :	2024/10/8

3.2 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.

3.3 Measuring instrument setting

Spectrum analyzer settings	
Spectrum Analyzer function	Setting
Detector	Peak
RBW	1kHz
VBW	1kHz
Sweep	Auto couple
Trace	Allow the trace to stabilize.
Span	Sufficient to see the complete emission BW
Attenuation	Auto

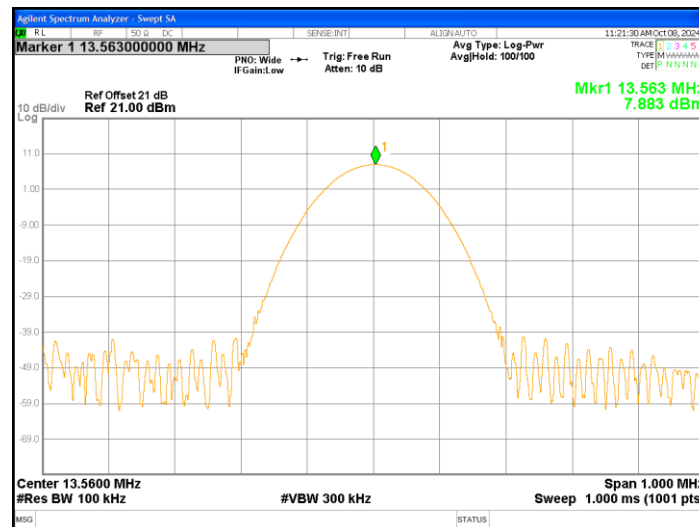
3.4 Test procedure

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.

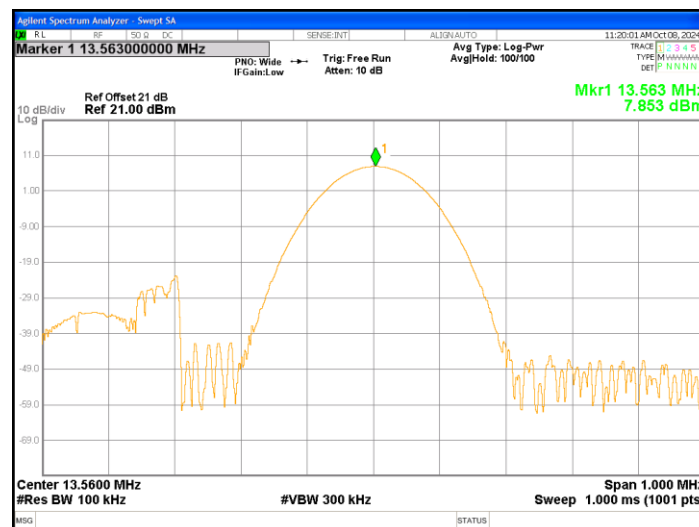
3.5 Test result

Temperature	Voltage	Frequency (MHz)	Center (MHz)	Deviation (%)	Limit (%)	Result
50°C	120	13.5630	13.5630	0.000	±0.01	Pass
40°C	120	13.5630	13.5630	0.000	±0.01	Pass
30°C	120	13.5630	13.5630	0.000	±0.01	Pass
20°C	102.00	13.5630	13.5630	0.000	±0.01	Pass
	120	13.5630	13.5630	0.000	±0.01	Pass
	138.00	13.5630	13.5630	0.000	±0.01	Pass
10°C	120	13.5630	13.5630	0.000	±0.01	Pass
0°C	120	13.5630	13.5630	0.000	±0.01	Pass
-10°C	120	13.5630	13.5630	0.000	±0.01	Pass
-20°C	120	13.5630	13.5630	0.000	±0.01	Pass

-20°C @AC 120V



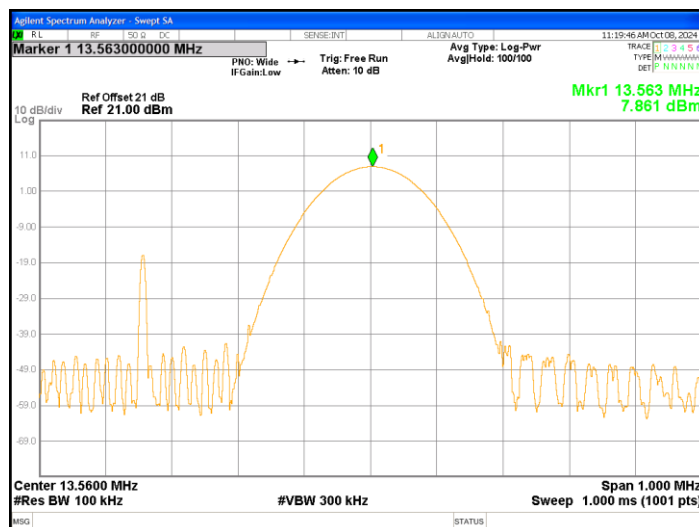
-10°C @AC 120V



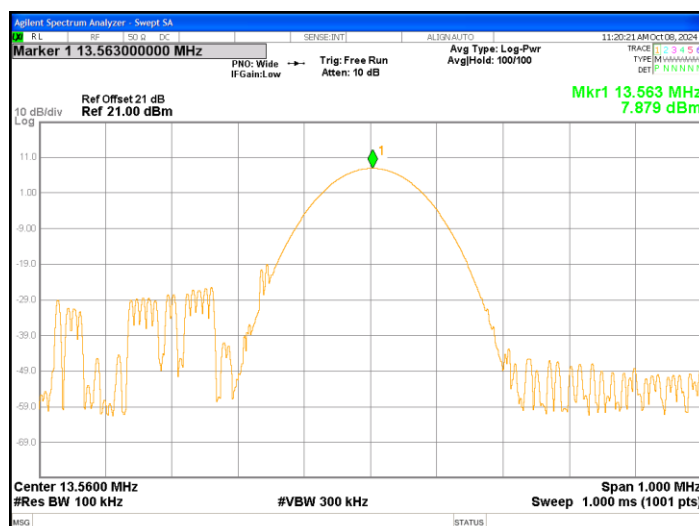
0°C @AC 120V



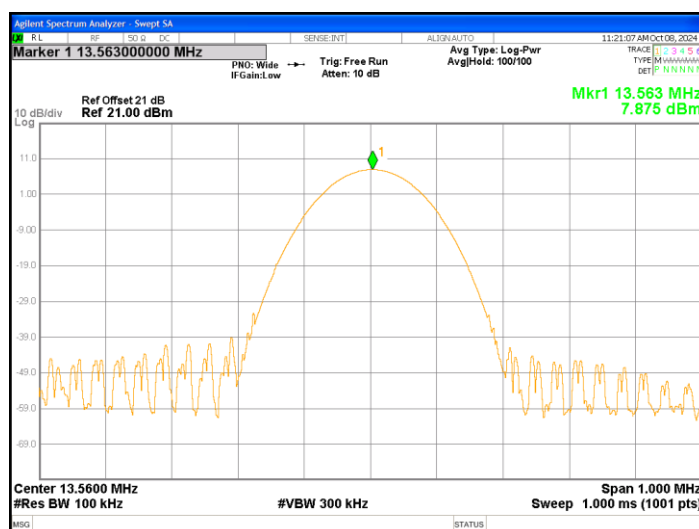
10°C @ AC 120V



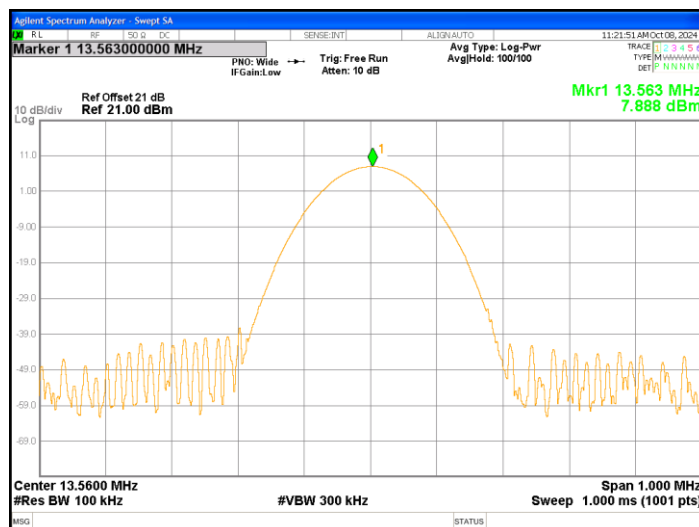
20°C @ AC 102V



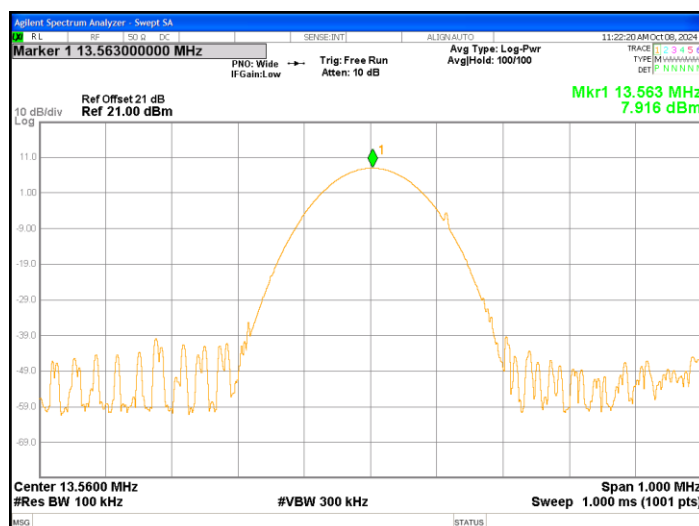
20°C @ AC 120V



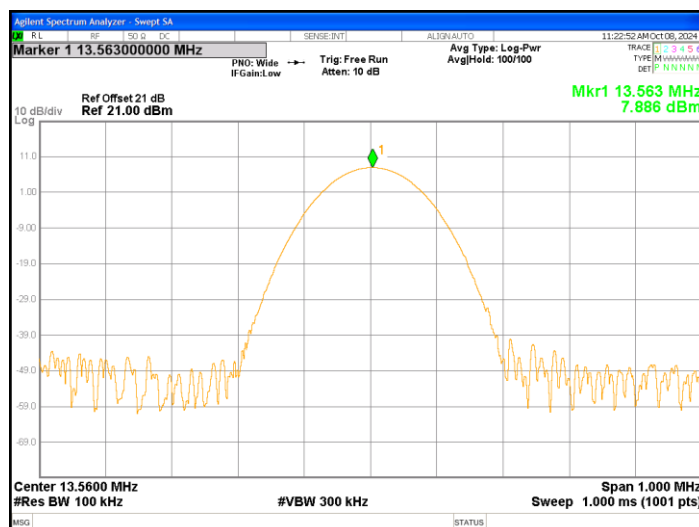
20°C @ AC 138V



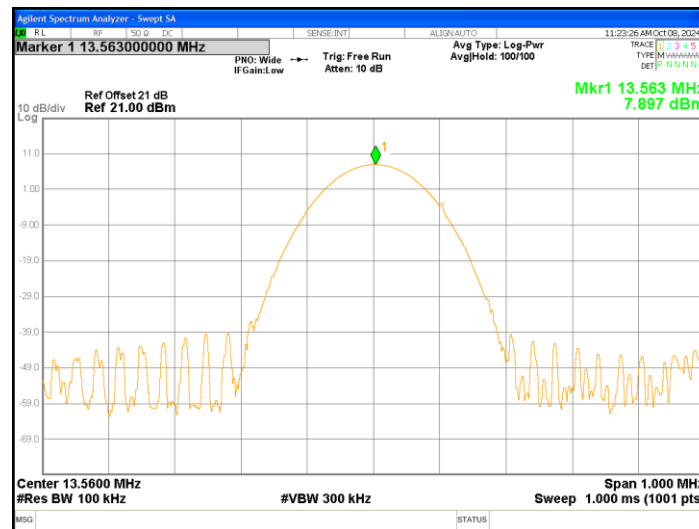
30°C @ AC 120V



40°C @ AC 120V



50°C @ AC 120V



4. Out of band Radiated Emissions

4.1 Operating environment

Temperature (°C) :	25
Relative Humidity (%) :	71
Test date :	2024/10/09

4.2 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

4.3 Measuring instrument setting

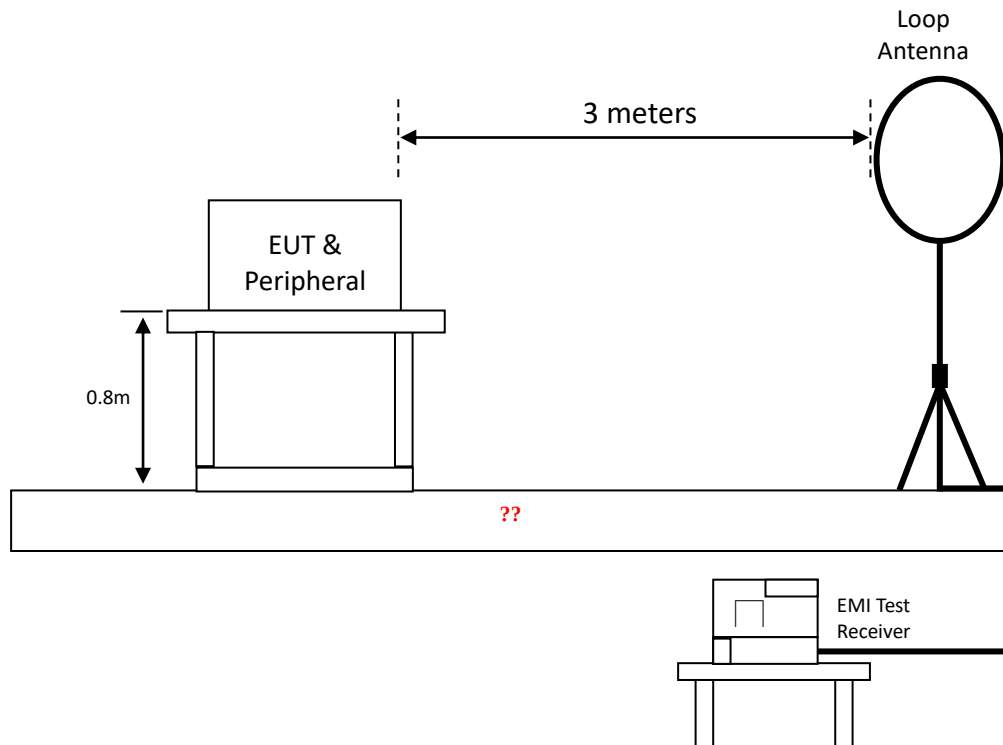
Receiver settings	
Receiver function	Setting
Detector	QP
RBW	9-150 kHz ; 200-300 Hz 0.15-30 MHz; 9-10 kHz 30-1000 MHz; 100-120 kHz
VBW	$\geq 3 \times$ RBW
Sweep	Auto couple
Attenuation	Auto

4.4 Test procedure

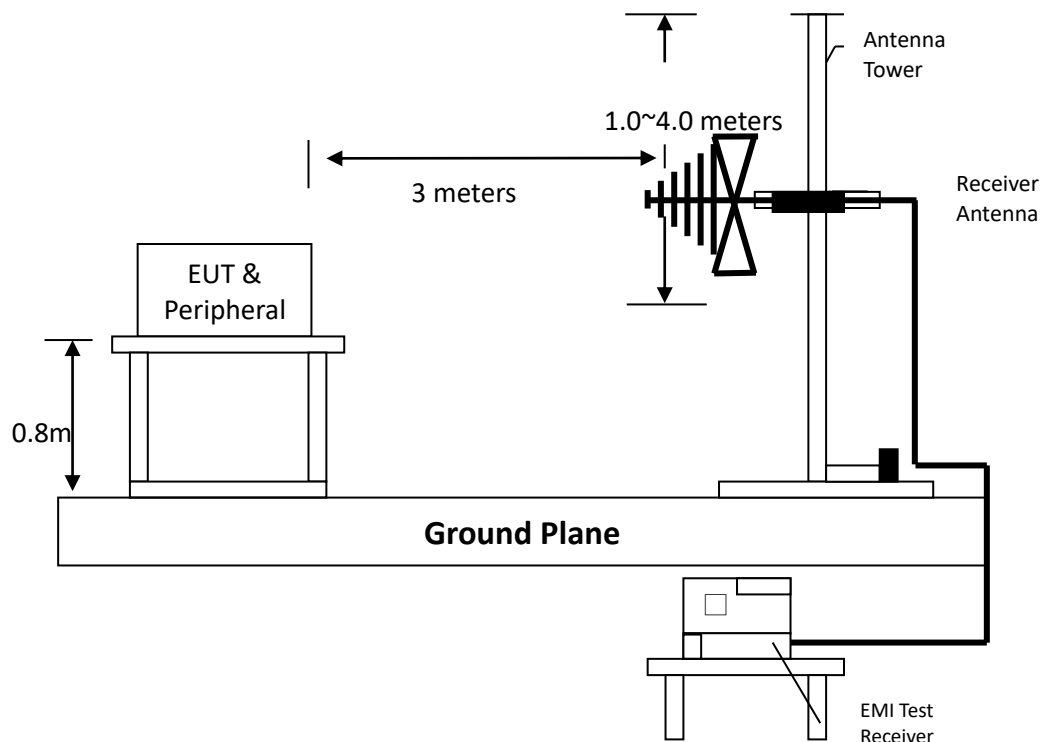
1. Configure the EUT according to ANSI C63.10:2013. The EUT was placed on the top of the turntable 0.8 meter above ground. The center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the companion 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.

4.5 Test configuration

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



4.5.2 Radiated emission below 1GHz using Bilog Antenna



TEST REPORT

4.6 Test result

4.6.1 Measurement results: frequency range from 9 kHz to 30 MHz

Antenna Polarity	Frequency (MHz)	Detector	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
Perpendicular	0.489	PK	17.90	31.07	48.97	93.82	-44.85
Perpendicular	0.969	PK	18.03	21.84	39.87	67.90	-28.03
Perpendicular	1.329	PK	17.97	18.51	36.48	65.16	-28.68
Perpendicular	1.898	PK	17.91	16.45	34.36	69.54	-35.18
Perpendicular	2.228	PK	17.92	11.39	29.31	69.54	-40.23
Perpendicular	2.438	PK	17.94	10.47	28.41	69.54	-41.13

Remark: Corr. Factor = Antenna Factor + Cable Loss

Antenna Polarity	Frequency (MHz)	Detector	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
Parallel	0.489	PK	17.90	31.23	49.13	93.82	-44.69
Parallel	0.969	PK	18.03	21.65	39.68	67.90	-28.22
Parallel	1.359	PK	17.96	17.57	35.53	64.96	-29.43
Parallel	1.449	PK	17.96	16.83	34.79	64.40	-29.61
Parallel	1.898	PK	17.91	16.94	34.85	69.54	-34.69
Parallel	2.018	PK	17.90	14.00	31.90	69.54	-37.64

Remark: Corr. Factor = Antenna Factor + Cable Loss

Antenna Polarity	Frequency (MHz)	Detector	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
Ground-parallel	0.519	PK	17.92	21.58	39.50	73.34	-33.84
Ground-parallel	1.359	PK	17.96	16.78	34.74	64.96	-30.22
Ground-parallel	1.449	PK	17.96	17.05	35.01	64.40	-29.39
Ground-parallel	1.868	PK	17.91	16.90	34.81	69.54	-34.73
Ground-parallel	2.468	PK	17.95	11.10	29.05	69.54	-40.49
Ground-parallel	2.768	PK	17.98	11.24	29.22	69.54	-40.32

Remark: Corr. Factor = Antenna Factor + Cable Loss

4.6.2 Measurement results: frequencies below 1 GHz

Antenna Polarity	Frequency (MHz)	Spectrum Analyzer Detector	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
Horizontal	162.89	PK	20.53	16.42	36.95	43.50	-6.55
Horizontal	312.27	PK	22.04	14.48	36.52	46.00	-9.48
Horizontal	395.69	PK	24.14	10.01	34.15	46.00	-11.85
Horizontal	593.57	PK	28.71	9.69	38.40	46.00	-7.60
Horizontal	792.42	PK	31.99	6.71	38.70	46.00	-7.30
Horizontal	800.18	PK	32.01	8.14	40.15	46.00	-5.85

Remark: Corr. Factor = Antenna Factor + Cable Loss

Antenna Polarity	Frequency (MHz)	Spectrum Analyzer Detector	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
Vertical	74.62	PK	17.34	19.73	37.07	40.00	-2.93
Vertical	147.37	PK	20.40	13.70	34.10	43.50	-9.40
Vertical	312.27	PK	22.04	16.86	38.90	46.00	-7.10
Vertical	480.08	PK	26.02	11.64	37.66	46.00	-8.34
Vertical	594.54	PK	28.74	12.84	41.58	46.00	-4.42
Vertical	791.45	PK	31.99	10.12	42.11	46.00	-3.89

Remark: Corr. Factor = Antenna Factor + Cable Loss

5. AC Power Line Conducted Emission

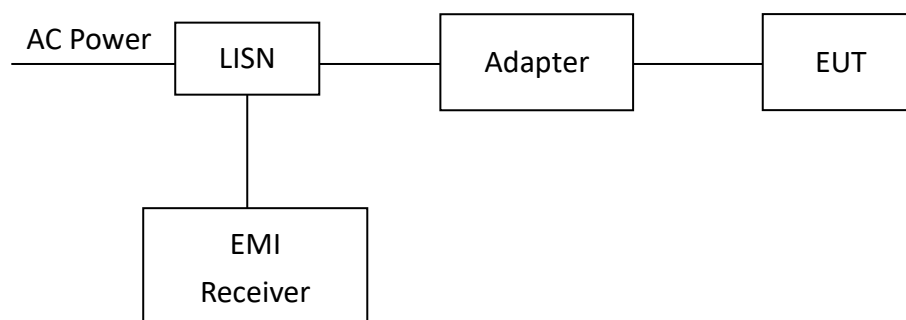
5.1 Measuring instrument setting

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

5.2 Test Procedure

Step 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.
Step 2	Connect EUT or host of EUT to the power mains through a line impedance stabilization network.
Step 3	All the companion devices are connected to the other LISN. The LISN should provide 50Uh/50ohms coupling impedance.
Step 4	The frequency range from 150 kHz to 30MHz was searched.
Step 5	Set the test-receiver system to peak detector and specified bandwidth with maximum hold mode.
Step 6	The measurement has to be done between each power line and ground at the power terminal.

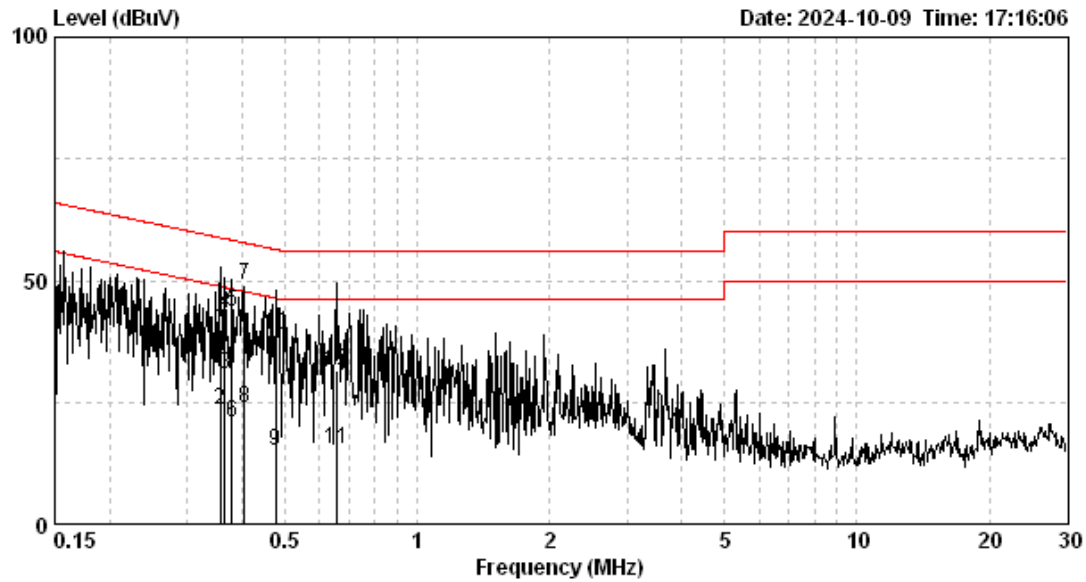
5.3 Test Diagram



5.4 Limit

Frequency (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

5.5 Test Results

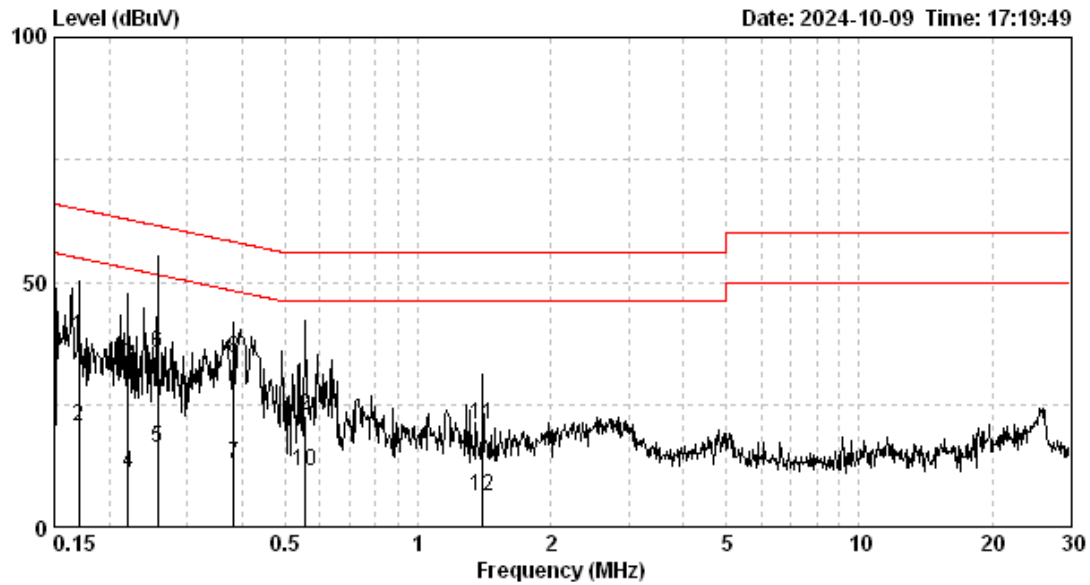


Test voltage : AC 120V / 60Hz
 Temp. / R.H. : 24 °C / 74 %
 Atmospheric pressure : 1008 hPa

Phase	Frequency (MHz)	Corr. Factor (dB)	Reading QP (dBuV)	Level QP (dBuV)	Limit QP (dBuV)	Reading AV (dBuV)	Level AV (dBuV)	Limit AV (dBuV)	Margin (dB)	
									QP	AV
LINE	0.358	9.57	30.48	40.05	58.78	13.78	23.35	48.78	-18.73	-25.43
LINE	0.365	9.57	33.76	43.33	58.61	21.23	30.80	48.61	-15.28	-17.81
LINE	0.379	9.57	33.94	43.50	58.30	11.31	20.87	48.30	-14.80	-27.42
LINE	0.404	9.57	39.40	48.97	57.77	14.26	23.83	47.77	-8.81	-23.95
LINE	0.476	9.57	29.24	38.82	56.41	5.44	15.02	46.41	-17.59	-31.39
LINE	0.654	9.58	21.94	31.52	56.00	5.93	15.51	46.00	-24.48	-30.49

Remark:

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



Test voltage : AC 120V / 60Hz
 Temp. / R.H. : 24 °C / 74 %
 Atmospheric pressure : 1008 hPa

Phase	Frequency (MHz)	Corr. Factor (dB)	Reading QP (dBuV)	Level QP (dBuV)	Limit QP (dBuV)	Reading AV (dBuV)	Level AV (dBuV)	Limit AV (dBuV)	Margin (dB)	
									QP	AV
NEUTRAL	0.170	9.57	29.22	38.79	64.94	11.05	20.62	54.94	-26.15	-34.32
NEUTRAL	0.221	9.58	23.40	32.98	62.79	1.56	11.14	52.79	-29.81	-41.65
NEUTRAL	0.258	9.58	25.87	35.45	61.51	6.71	16.29	51.51	-26.06	-35.22
NEUTRAL	0.383	9.59	24.78	34.36	58.21	3.10	12.68	48.21	-23.85	-35.53
NEUTRAL	0.555	9.59	13.05	22.65	56.00	1.82	11.42	46.00	-33.35	-34.58
NEUTRAL	1.403	9.61	11.31	20.92	56.00	-3.35	6.26	46.00	-35.08	-39.74

Remark:

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

Appendix A: Test equipment list

Test Equipment	Brand	Model No.	Serial No.	Calibration Date	Next Calibration Date
EMI Test Receiver	KEYSIGHT	N9038B	MY63060107	2024/03/06	2025/03/05
Signal Analyzer	Agilent	N9030A	MY51380492	2024/07/09	2025/07/08
Active Loop Antenna	SCHWARZBECK	FMZB1519	1519-067	2024/01/16	2025/01/15
Broadband Antenna	SCHWARZBECK	VULB 9168	9168-172	2024/01/02	2025/01/01
Cable	SUHNER	SUCOFLEX 104	295105/4	2024/03/02	2025/03/02
Cable	SUHNER	SUCOFLEX 104P	CB0005	2024/03/02	2025/03/02
966-2_3m Semi-Anechoic Chamber	CHANCE MOST	CEM-966_2	N/A	2024/07/30	2025/07/29
Power Meter	Anritsu	ML2495A	0844001	2024/01/08	2025/01/07
Power Sensor	Anritsu	MA2491A	031543	2024/01/08	2025/01/07
20dB Attenuator	PE	PE7001-20	N/A	2024/05/23	2025/05/22
966-2_3m Semi-Anechoic Chamber	CHANCE MOST	CEM-966_2	N/A	2024/07/30	2025/07/29
Test software	Audix	e3	V9	NCR	NCR
LISN	R&S	ENV216	101160	2024/06/26	2025/06/25
Cable	SUHNER	EMCCFD300-BM-N M-6000	170502	2024/06/25	2025/06/24
EMI Test Receiver	R&S	ESCI	100018	2024/07/23	2025/07/22
Test software	Audix	e3	V4.20040112L	NCR	NCR
Test site	Intertek	Con-2	N/A	NCR	NCR

Note: No Calibration Required (NCR).

Appendix B: Measurement Uncertainty

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2.0$.

Item	Uncertainty
Frequency stability	0.06 ppm
Radiated disturbances from 9kHz~30MHz in a semi-anechoic chamber at a distance of 3m	2.73 dB
Vertically polarized radiated disturbances from 30MHz~1GHz in a semi-anechoic chamber at a distance of 3m	3.91 dB
Horizontally polarized radiated disturbances from 30MHz~1GHz in a semi-anechoic chamber at a distance of 3m	3.49 dB
Conducted Measurement	0.69 dB
AC Conducted Emission	1.31 dB