

Shummi Enterprise Co., Ltd.

TEST REPORT

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Radio Spectrum TEST REPORT

Applicant:	Shummi Enterprise Co., Ltd. 13F.-1, NO. 188, SEC. 5, NANJING E. RD., SONGSHAN DIST., TAIPEI CITY 105, TAIWAN
Product:	ECU1
Model No.:	T0315
FCC ID:	2AXUW-VENUS02
Brand Name:	Eaznuf
Test Method/ Standard:	47 CFR FCC Part 15.209
Test By:	Intertek Testing Services Taiwan Ltd., Hsinchu Laboratory 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
201000193TWN-001	Nov. 16, 2020	Original report

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Summary of Test Data

Test Requirement	Applicable Rule	Result
Radiated Emission test	15.209	Pass
Conducted Emission test	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:	ECU1
Model No.:	T0315
Operating Frequency:	506 kHz-570 kHz
Rated Power:	DC 5V from USB port
Power Cord:	N/A
Sample receiving date:	Sep. 21, 2020
Sample condition:	Workable
Test Date(s):	Sep. 21, 2020 ~ Oct. 13, 2020

1.2 Antenna description

Antenna Type : Coil antenna

Connector Type : Fixed

2. Test specifications

2.1 Test standard

The EUT was performed according to the requirement in FCC Part 15 Subpart C Section 15.209.

2.2 Operation mode

The toothbrush put on wireless charge tray and connect adaptor can transmit continuously.

2.3 Peripherals equipment

No.	Model no.	Specification
Adapter	AC-0330-TW	INPUT:100-240Vac, 150mA, 50-60Hz OUTPUT:5.0Vdc, 850mA

Peripherals	Brand	Model No.	Serial No.	Data cable
Notebook PC	HP	HP ProBook 440 G3	5CD8021S9H	Micro USB Cable 0.8 meter × 1
Electric Toothbrush	Eaznuf	T0315	N/A	N/A

3. Radiated emission test FCC 15.209

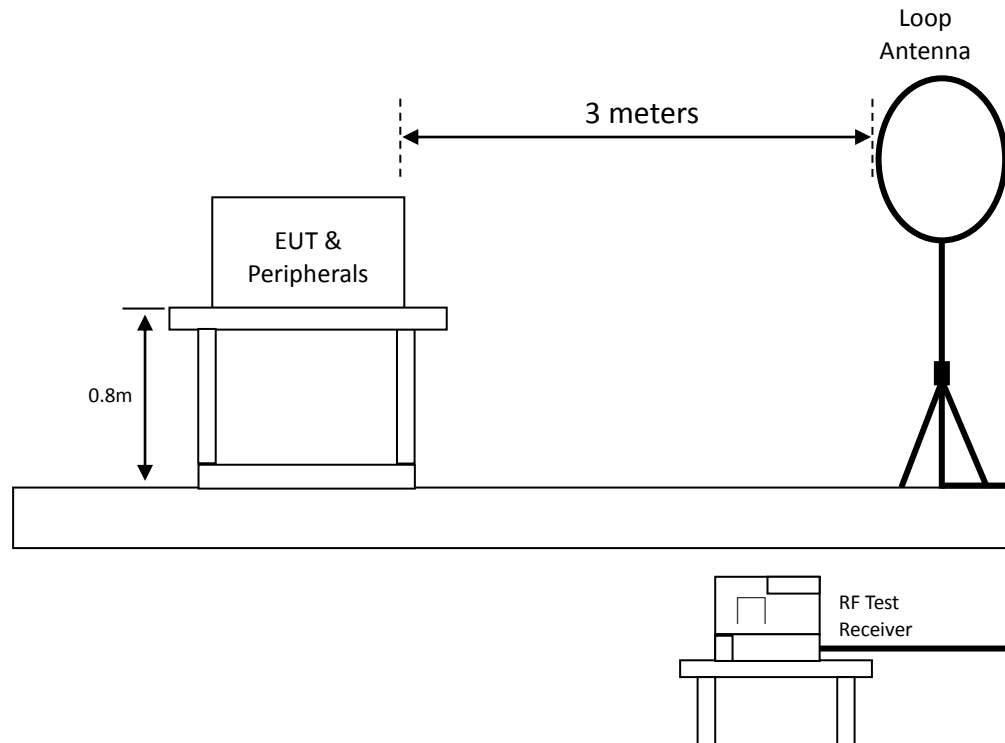
3.1 Operating environment

Temperature: 27 °C
Relative Humidity: 59 %

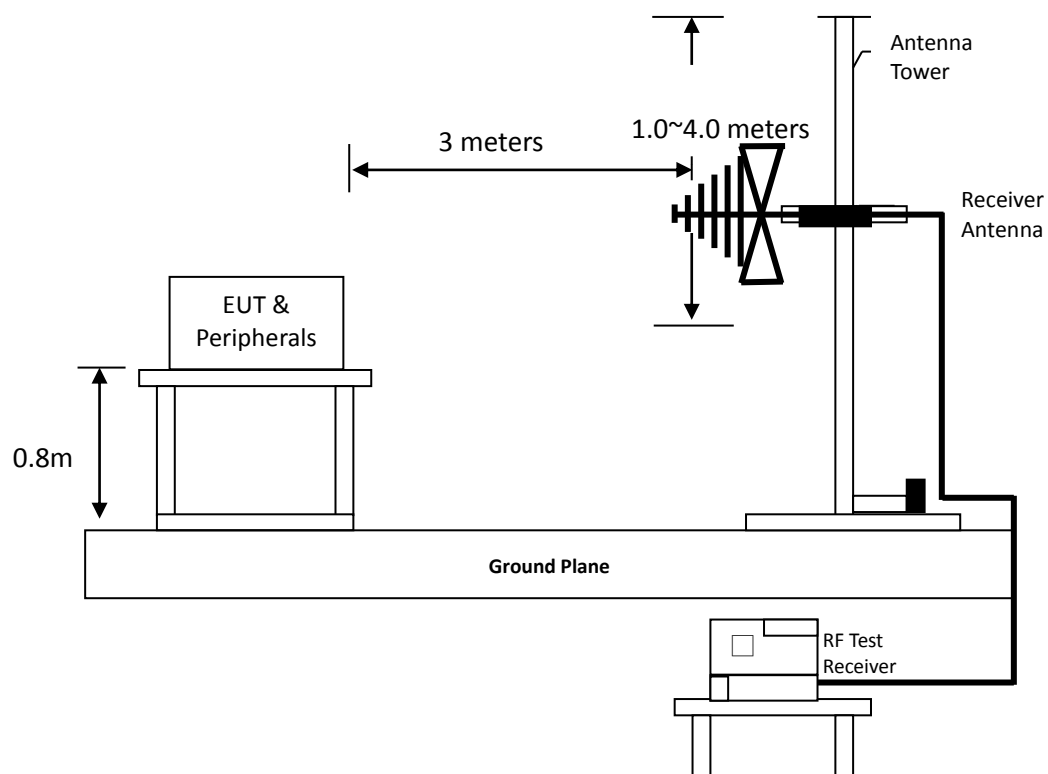
3.2 Test setup & procedure

Step 1	Configure the EUT according to ANSI C63.10:2013. The EUT was placed on the top of the turntable 0.8 meter (below 1GHz) and 1.5 meter (above 1GHz) 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.
Step 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.
Step 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.
Step 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.
Step 5	Set the test-receiver system to peak or CISPR quasi-peak detector with specified bandwidth under maximum hold mode.
Step 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.
Step 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.

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



3.2.2 Radiated emission below 1GHz using Bilog Antenna



3.3 Radiated emission limit

3.3.1 General radiated emission limit

The spurious Emission shall test through the 10th harmonic. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

Frequency (MHz)	Field Strength (μV/m)	Field Strength (dBμV/m)	Measurement Distance
0.009-0.490	2400/F(KHz)	20 log (uV/m)	300
0.490-1.705	2400/F(KHz)	20 log (uV/m)	30
1.705-30	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	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

3.4 Radiated emission test data FCC 15.209

3.4.1 Measurement results: Fundamental emission

Ant Polarization	Frequency (MHz)	Spectrum Analyzer Detector	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
Perpendicular	0.55	QP	18.43	43.24	61.67	72.80	-11.13
Parallel	0.55	QP	18.43	38.52	56.95	72.80	-15.85
Ground-parallel	0.55	QP	18.43	43.87	62.30	72.80	-10.50

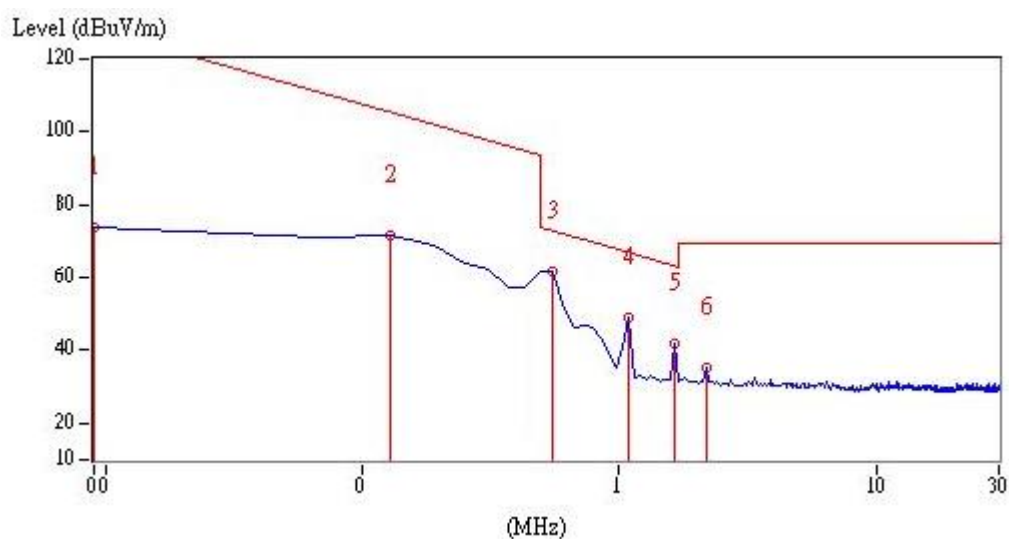
Remark: Corr. Factor = Antenna Factor + Cable Loss

3.4.2 Measurement results: frequencies equal to or less than 1 GHz

Test condition : Tx mode

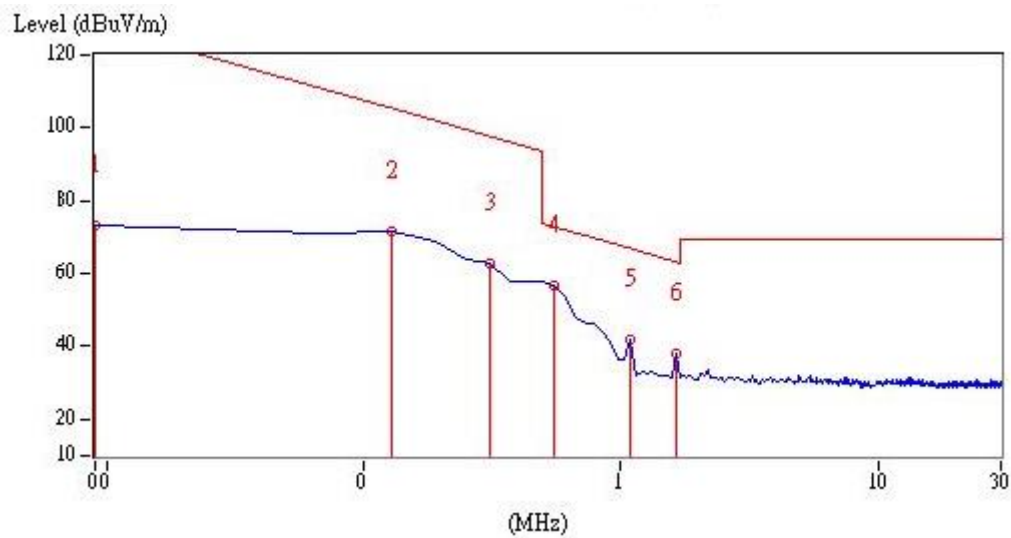
Ant Polarity	Frequency (MHz)	Detector	Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3m (dBμV/m)	Margin (dB)
Perpendicular	0.01	AV	18.28	55.49	73.77	127.60	-53.83
Perpendicular	0.13	AV	17.91	53.55	71.46	105.33	-33.87
Perpendicular	1.09	QP	18.46	30.76	49.22	66.86	-17.64
Perpendicular	1.64	QP	18.47	23.41	41.88	63.31	-21.43
Perpendicular	2.19	QP	18.47	16.74	35.21	69.54	-34.33

Remark: Corr. Factor = Antenna Factor + Cable Loss



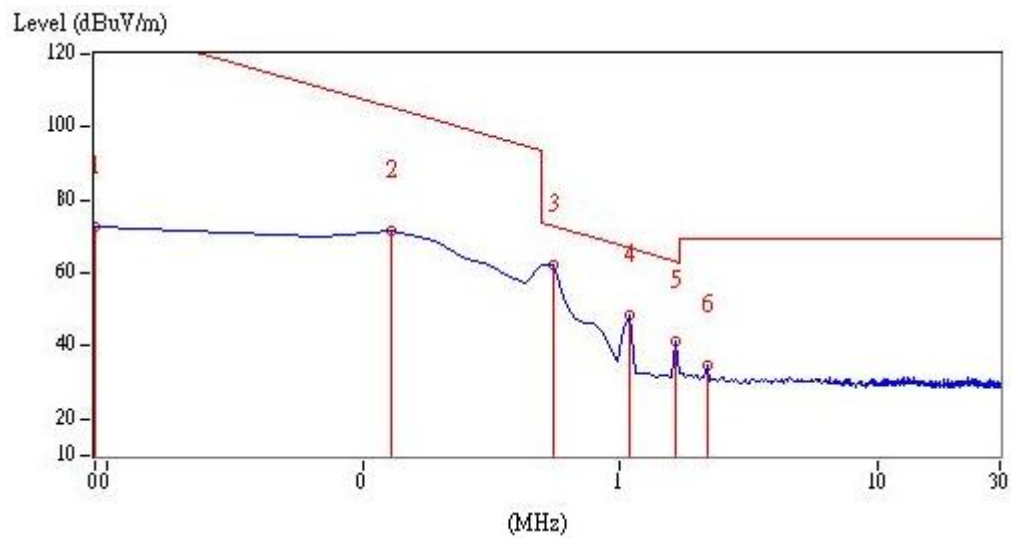
Ant Polarity	Frequency (MHz)	Detector	Factor (dB/m)	Reading (dB μ V)	Corrected Reading (dB μ V/m)	Limit @ 3m (dB μ V/m)	Margin (dB)
Parallel	0.01	AV	18.28	55.06	73.34	127.60	-54.26
Parallel	0.13	AV	17.91	53.88	71.79	105.33	-33.54
Parallel	0.31	AV	18.52	44.19	62.71	97.78	-35.07
Parallel	1.09	QP	18.46	23.48	41.94	66.86	-24.92
Parallel	1.64	QP	18.47	19.42	37.89	63.31	-25.42

Remark: Corr. Factor = Antenna Factor + Cable Loss



Ant Polarity	Frequency (MHz)	Detector	Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3m (dBμV/m)	Margin (dB)
Ground-parallel	0.01	AV	18.28	54.63	72.91	127.60	-54.69
Ground-parallel	0.13	AV	17.91	53.42	71.33	105.33	-34.00
Ground-parallel	1.09	QP	18.46	30.03	48.49	66.86	-18.37
Ground-parallel	1.64	QP	18.47	22.72	41.19	63.31	-22.12
Ground-parallel	2.19	QP	18.47	16.30	34.77	69.54	-34.77

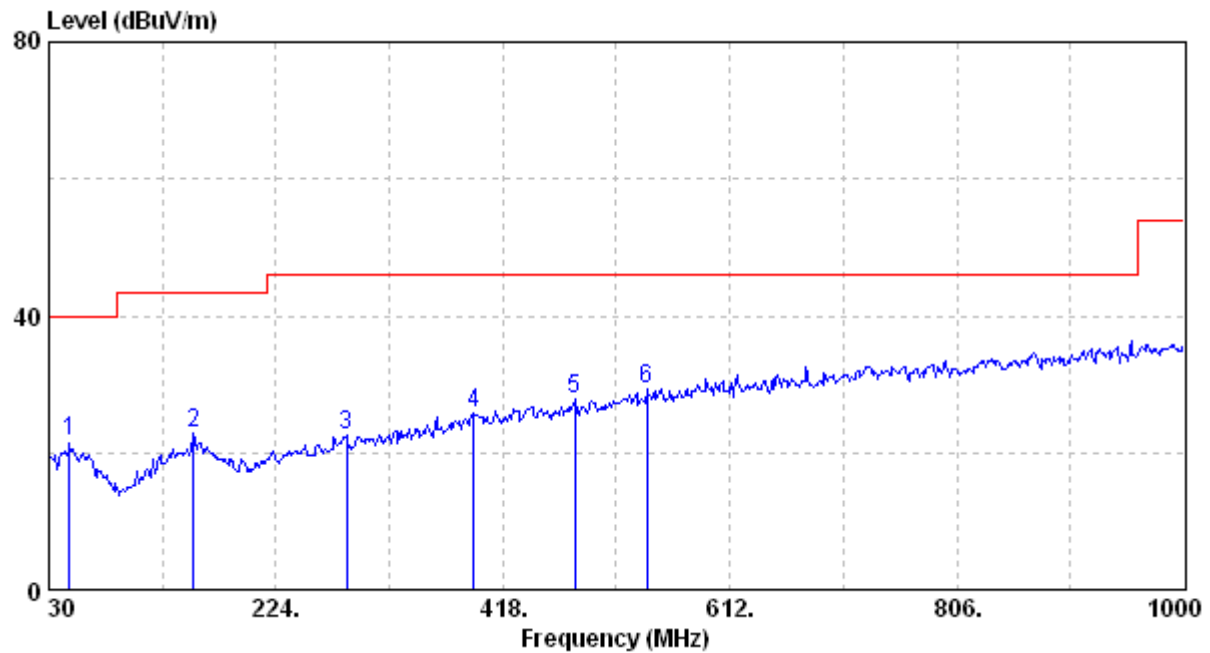
Remark: Corr. Factor = Antenna Factor + Cable Loss



Test condition : Tx mode

Ant Polarity	Frequency (MHz)	Detector	Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3m (dBμV/m)	Margin (dB)
Vertical	47.46	QP	21.43	0.17	21.60	40.00	-18.40
Vertical	153.19	QP	21.30	1.47	22.77	43.50	-20.73
Vertical	284.14	QP	22.18	0.37	22.55	46.00	-23.45
Vertical	392.78	QP	25.02	0.76	25.78	46.00	-20.22
Vertical	479.11	QP	26.84	0.86	27.70	46.00	-18.30
Vertical	541.19	QP	28.07	1.33	29.40	46.00	-16.60

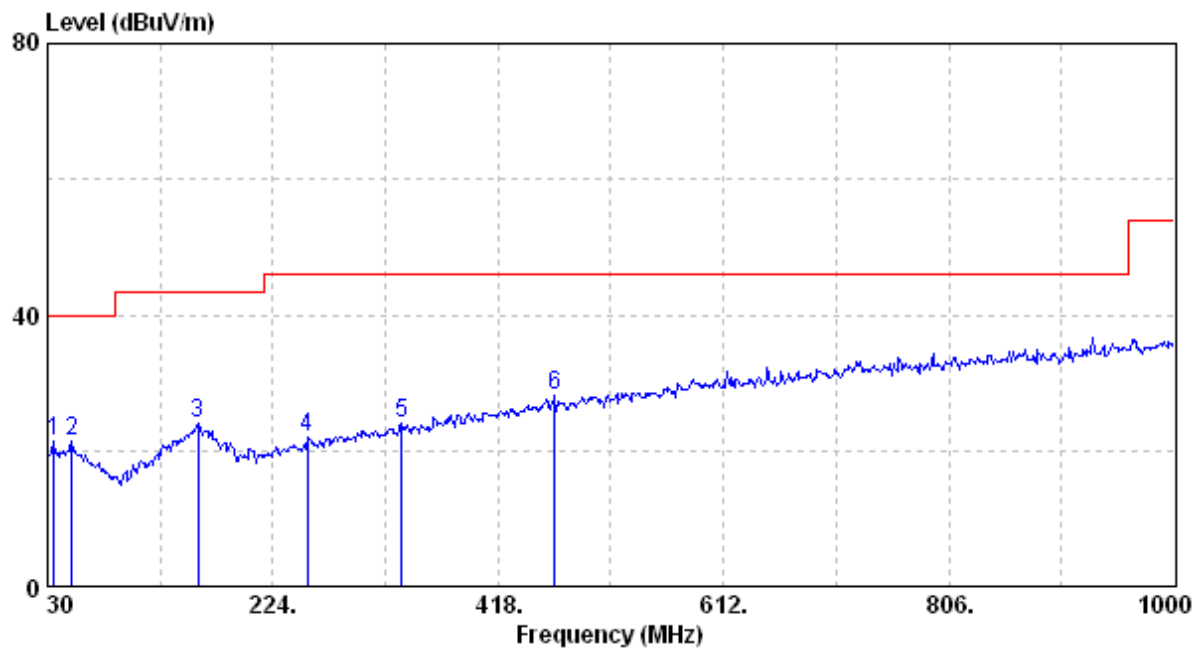
Remark: Corr. Factor = Antenna Factor + Cable Loss



Test condition : Tx mode

Ant Polarity	Frequency (MHz)	Detector	Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3m (dBμV/m)	Margin (dB)
Horizontal	35.82	QP	20.14	1.32	21.46	40.00	-18.54
Horizontal	51.34	QP	21.03	0.40	21.43	40.00	-18.57
Horizontal	159.98	QP	21.44	2.70	24.14	43.50	-19.36
Horizontal	254.07	QP	21.06	0.93	21.99	46.00	-24.01
Horizontal	334.58	QP	23.48	0.42	23.90	46.00	-22.10
Horizontal	466.50	QP	26.66	1.41	28.07	46.00	-17.93

Remark: Corr. Factor = Antenna Factor + Cable Loss



4. Conducted emission FCC 15.207

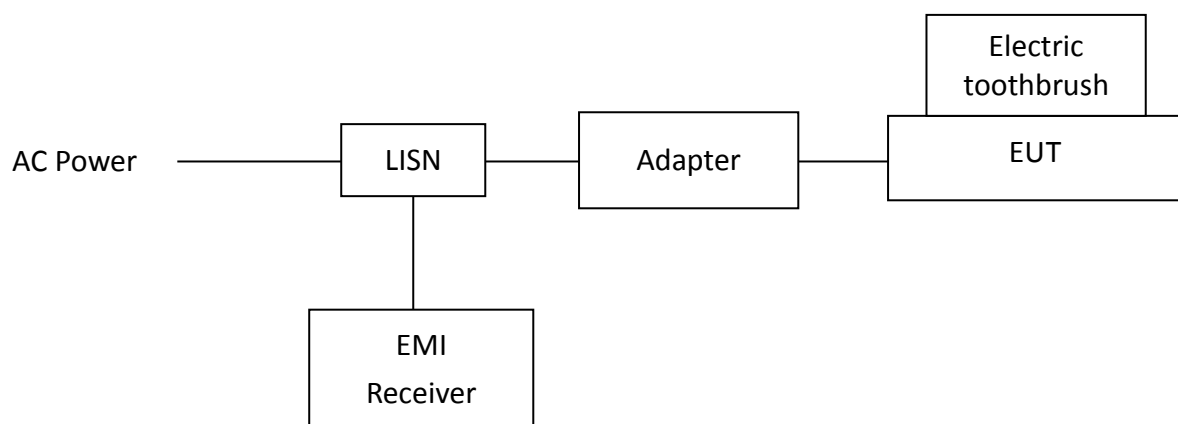
4.1 Measuring instrument setting

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

4.2 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.

4.3 Test Diagram



4.4 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

4.5 Operating Environment Condition

Temperature (°C) :	26
Relative Humidity (%) :	50
Atmospheric Pressure (hPa) :	1005
Test date :	Oct. 13, 2020

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4.6 Test Results

Phase: Live Line

Test Condition: Tx mode

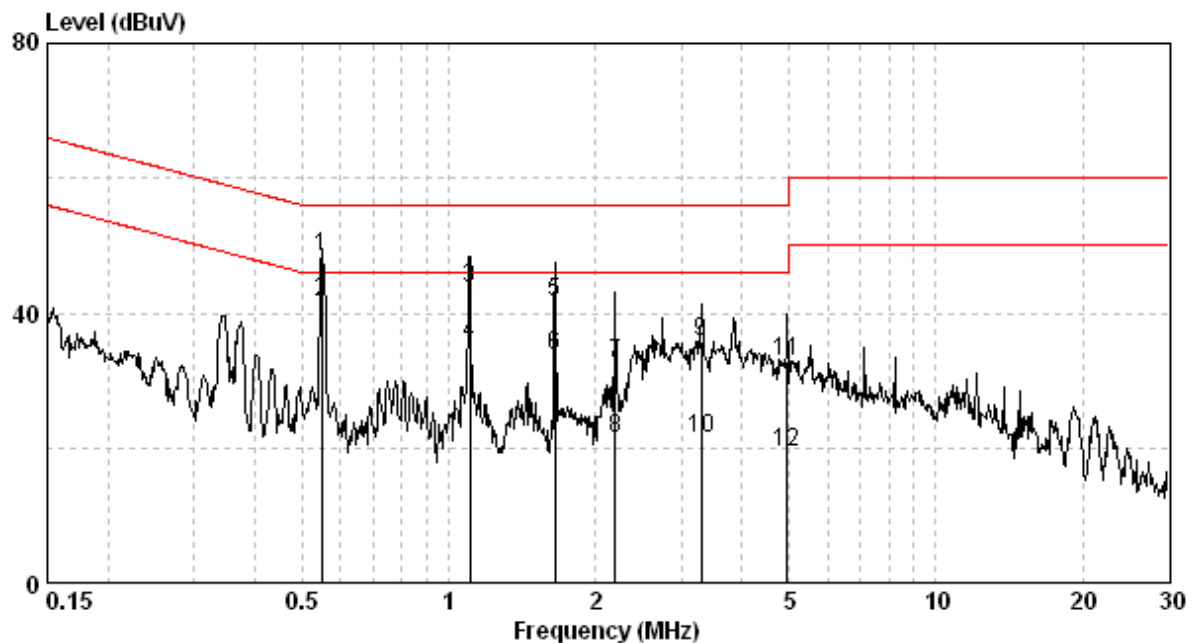
Frequency (MHz)	Corr. Factor (dB)	Reading QP (dBuV)	Level QP (dBuV)	Limit QP (dBuV)	Reading AV (dBuV)	Level AV (dBuV)	Limit AV (dBuV)	Margin (dB)	
								QP	AV
0.549	9.68	38.67	48.36	56.00	31.93	41.61	46.00	-7.64	-4.39
1.106	9.71	34.03	43.74	56.00	25.69	35.41	46.00	-12.26	-10.59
1.654	9.76	31.83	41.59	56.00	23.93	33.69	46.00	-14.41	-12.31
2.201	9.78	22.79	32.57	56.00	11.62	21.40	46.00	-23.43	-24.60
3.293	9.79	25.91	35.70	56.00	11.61	21.40	46.00	-20.30	-24.60
4.952	9.81	22.98	32.79	56.00	9.67	19.48	46.00	-23.21	-26.52

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)



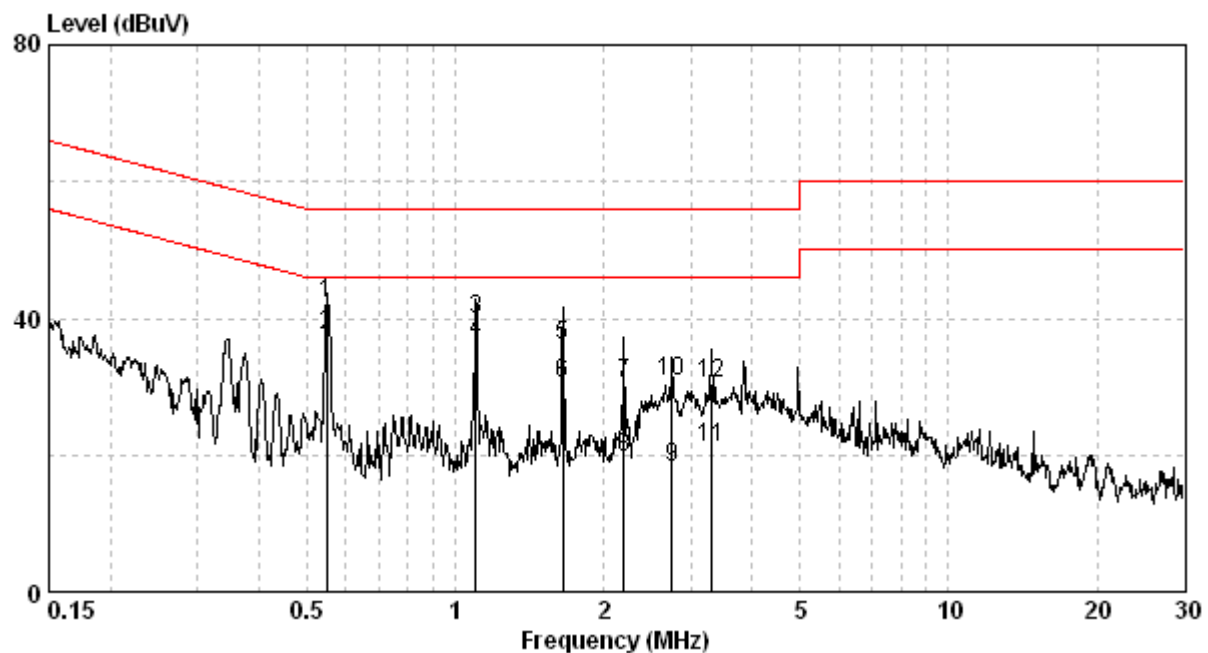
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Phase: Neutral Line
Test Condition: Tx mode

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
0.549	9.68	32.63	42.31	56.00	27.79	37.47	46.00	-13.69	-8.53
1.100	9.71	30.23	39.94	56.00	26.87	36.58	46.00	-16.06	-9.42
1.654	9.76	26.32	36.08	56.00	20.68	30.44	46.00	-19.92	-15.56
2.201	9.78	20.64	30.43	56.00	9.88	19.66	46.00	-25.57	-26.34
2.750	9.79	20.86	30.65	56.00	8.25	18.04	46.00	-25.35	-27.96
3.293	9.79	20.69	30.49	56.00	11.22	21.02	46.00	-25.51	-24.98

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/ Test site	Brand	Model No.	Serial No.	Calibration Date	Next Calibration Date
EMI Test Receiver	Rohde & Schwarz	ESR-7	101232	2020/01/18	2021/01/16
Signal Analyzer	Agilent	N9030A	MY51380492	2020/08/17	2021/08/16
Active Loop Antenna	SCHWARZBECK MESS-ELEKTRONIC	FMZB1519	1519-067	2020/04/13	2021/04/12
Broadband Antenna	SHWARZBECK	VULB 9168	9168-172	2020/06/02	2021/06/01
966-2(A) Cable	SUHNER	SMA / EX 100	N/A	2020/08/17	2021/08/16
966-2(B) Cable	SUHNER	SUCOFLEX 104P	CB0005	2020/08/17	2021/08/16
966-2_3m Semi-Anechoic Chamber	966_2	CEM-966_2	N/A	2020/02/23	2021/02/22
EMI Test Receiver	R&S	ESCI	100059	2019/11/05	2020/11/03
LISN	R&S	ENV216	101159	2020/06/08	2021/06/07
CON-1 Cable	SUHNER	SUCOFLEX-104	26438414	2020/04/30	2021/04/29
Test software	Audix	e3	V4.20040112L	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 $k=2$.

Item	Uncertainty
Timing requirement of manually operated transmitter	1.15 dB
20dB Bandwidth	7.69 %
Radiated disturbances from 9kHz~30MHz in a semi-anechoic chamber at a distance of 3m	2.99 dB
Vertically polarized radiated disturbances from 30MHz~1GHz in a semi-anechoic chamber at a distance of 3m	5.10 dB
Horizontally polarized radiated disturbances from 30MHz~1GHz in a semi-anechoic chamber at a distance of 3m	5.19 dB
Vertically polarized Radiated disturbances from 1GHz~18GHz in a semi-anechoic chamber at a distance of 3m	4.29 dB
Horizontally polarized Radiated disturbances from 1GHz~18GHz in a semi-anechoic chamber at a distance of 3m	4.29 dB
AC Power Line Conducted Emission	2.52 dB