

**Brilliant Network & Automation
Integrated System Co., Ltd**

TEST REPORT

Model:
BR-RW-0002

REPORT NUMBER
220700323THC-001

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Radio Spectrum TEST REPORT

Applicant:	Brilliant Network & Automation Integrated System Co., Ltd No. 41, Keyi St., Zhunan Township, Miaoli County 350402, Taiwan
Product:	RFID Multifunction System
Model No.:	BR-RW-0002
FCC ID:	2A583-RW0002
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
220700323THC-001	Aug. 04, 2022	Original report

Table of Contents

1. General Information	5
1.1 Identification of the EUT	5
1.2 Adapter information	5
1.3 Antenna description	5
2. Test specifications.....	6
2.1 Test standard.....	6
2.2 Operation mode	6
3. Radiated emission test FCC 15.209	7
3.1 Test setup & procedure	7
3.2 Radiated emission limit	9
3.2.1 General radiated emission limit.....	9
3.3 Radiated emission test data FCC 15.209	10
3.3.1 Measurement results: Fundamental emission	10
3.3.2 Measurement results: Frequencies equal to or less than 1 GHz	11
4. Conducted emission FCC 15.207	16
4.1 Measuring instrument setting	16
4.2 Test Procedure	16
4.3 Test Diagram	16
4.4 Limit	17
4.5 Test Results	18
Appendix A: Test equipment list.....	20
Appendix B: Measurement Uncertainty.....	21

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:	RFID Multifunction System
Model No.:	BR-RW-0002
Operating Frequency:	134kHz
Rated Power:	DC 15V from adapter
Power Cord:	2C × 22AWG × 2.5m unshielded cable
Sample receiving date:	2022/07/21
Sample condition:	Workable
Test Date(s):	2022/07/25 ~ 2022/08/01

1.2 Adapter information

The EUT will be supplied with a power supply from below list:

No.	Model no.	Specification
Adapter	UN315-1510	I/P: 100-240Vac, 0.4A, 50-60Hz O/P: 15Vdc, 1A, 15W

1.3 Antenna description

Antenna Type : Dipole antenna

Connector Type : PH

2. Test specifications

2.1 Test standard

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

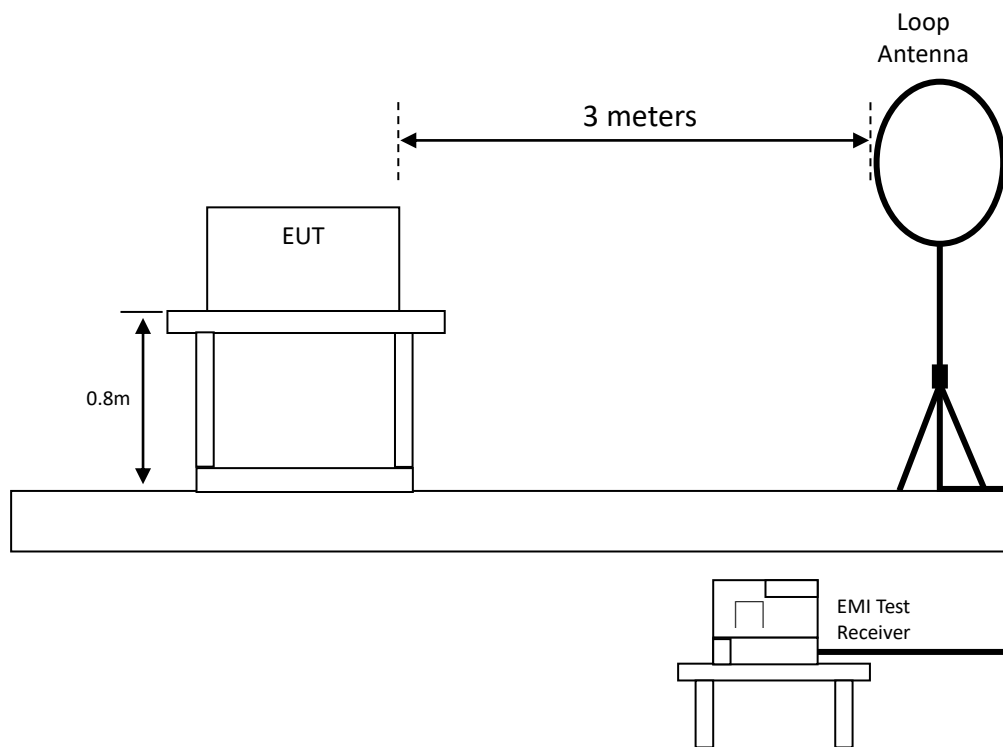
2.2 Operation mode

TX mode: The EUT transmit 134kHz continuously while we power on the EUT.

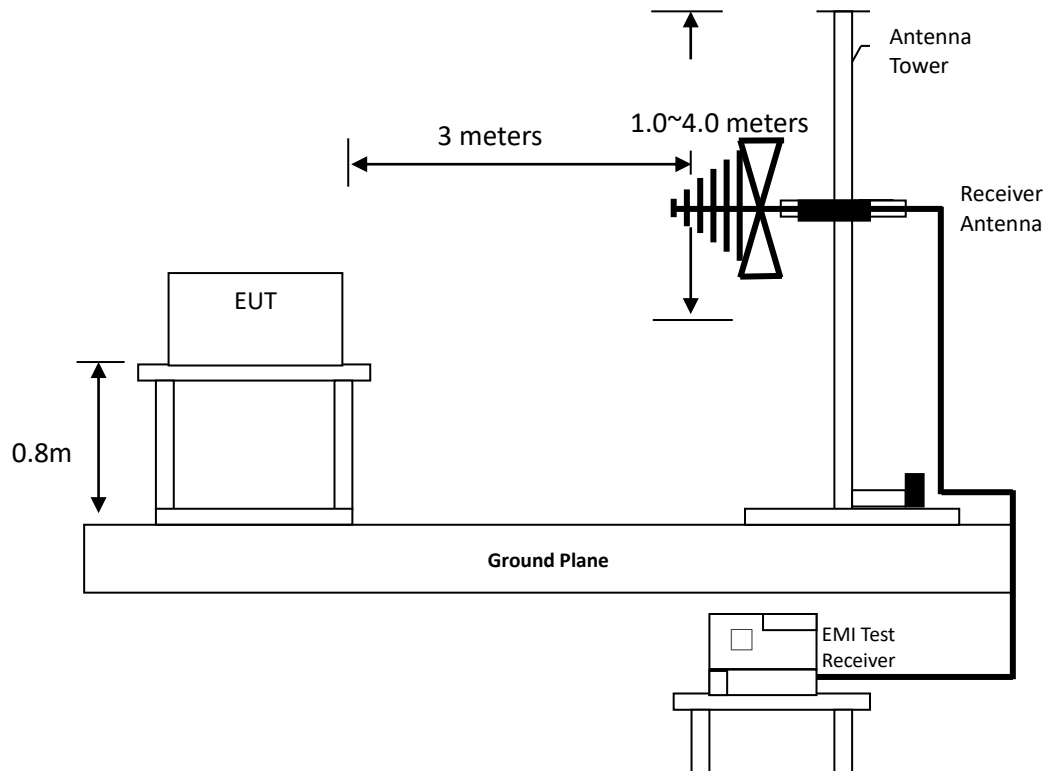
3. Radiated emission test FCC 15.209

3.1 Test setup & procedure

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



Radiated emission below 1GHz using Bilog Antenna



Radiated emissions were investigated cover the frequency range from 30MHz to 1000MHz using a receiver RBW of 120kHz record QP reading, and the frequency over 1GHz using a spectrum analyzer RBW of 1MHz and 10Hz VBW record Average reading. (15.209 paragraph), the Peak reading (1 MHz RBW/ 3 MHz VBW) recorded also on the report.

The EUT for testing is arranged on a turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter.

The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent three meters reading using inverse scaling with distance.

3.2 Radiated emission limit

3.2.1 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

3.3 Radiated emission test data FCC 15.209

3.3.1 Measurement results: Fundamental emission

Temperature:	28	°C
Relative Humidity:	55	%

Antenna Polarization	Frequency (MHz)	Spectrum Analyzer Detector	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
Perpendicular	0.134	AV	18.06	77.10	95.16	105.21	-10.05
Parallel	0.134	AV	18.06	73.91	91.97	105.21	-13.24
Ground-parallel	0.134	AV	18.06	62.68	80.74	105.21	-24.47

Remark: Corr. Factor = Antenna Factor + Cable Loss

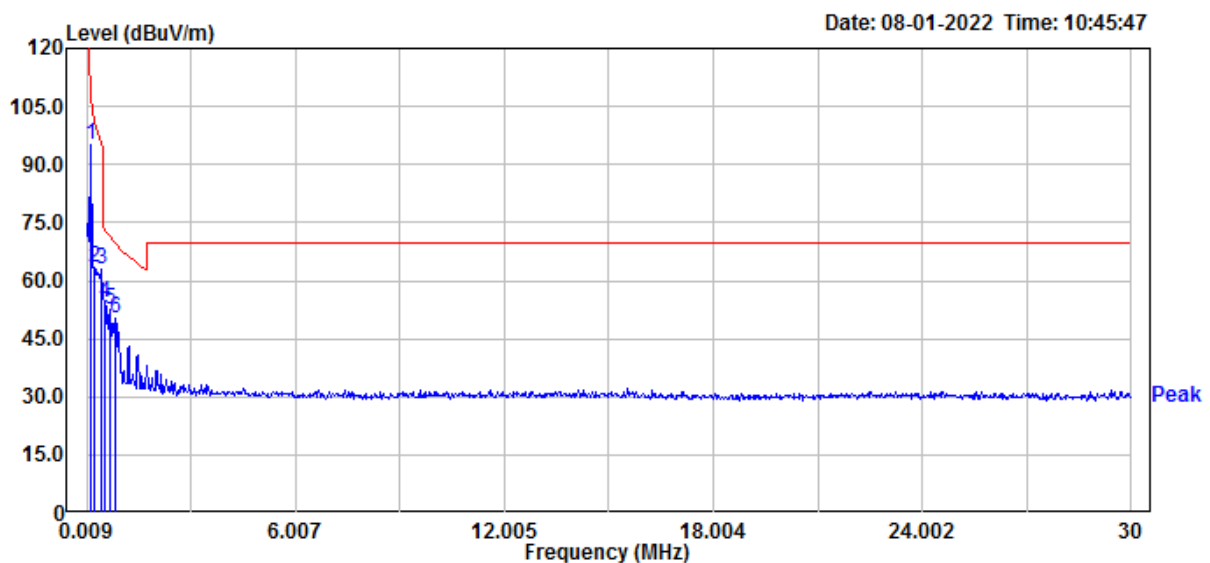
TEST REPORT

3.3.2 Measurement results: Frequencies equal to or less than 1 GHz

Temperature:	28	°C
Relative Humidity:	55	%

Antenna Polarity	Frequency (MHz)	Detector	Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3m (dBμV/m)	Margin (dB)
Perpendicular	0.129	AV	18.04	77.10	95.14	105.56	-10.42
Perpendicular	0.219	AV	18.35	45.25	63.60	100.85	-37.25
Perpendicular	0.399	AV	18.71	44.44	63.15	95.59	-32.44
Perpendicular	0.519	QP	18.81	35.72	54.53	73.34	-18.81
Perpendicular	0.669	QP	18.90	33.61	52.51	71.18	-18.67
Perpendicular	0.819	QP	18.99	31.30	50.29	69.36	-19.07

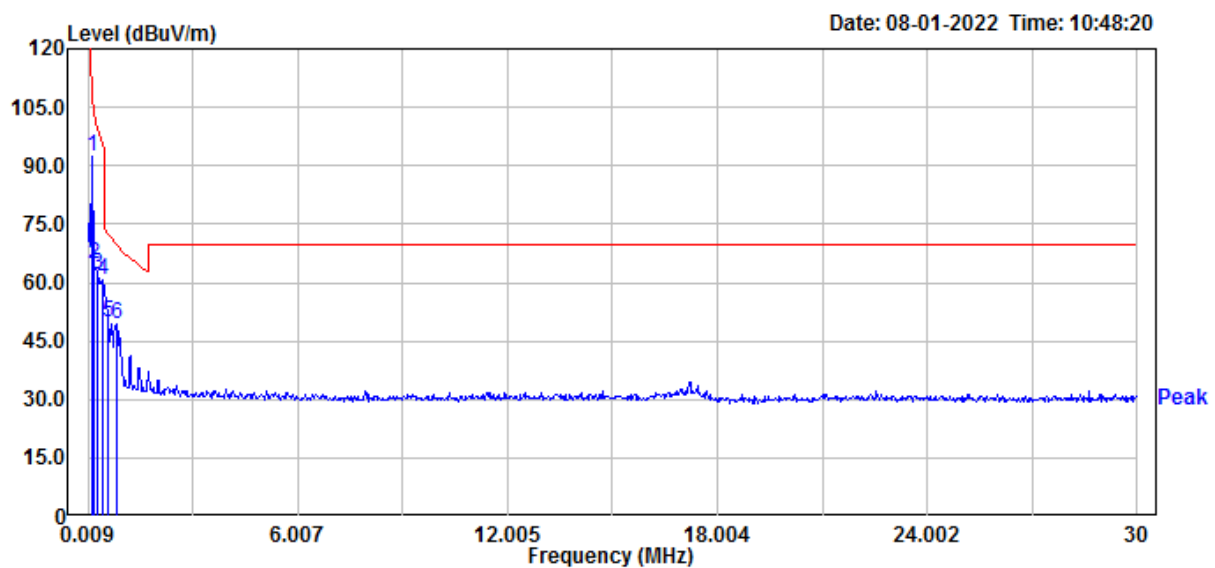
Remark: Corr. Factor = Antenna Factor + Cable Loss



TEST REPORT

Antenna Polarity	Frequency (MHz)	Detector	Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3m (dBμV/m)	Margin (dB)
Parallel	0.129	AV	18.04	74.14	92.18	105.56	-13.38
Parallel	0.159	AV	18.14	46.68	64.82	103.63	-38.81
Parallel	0.279	AV	18.55	43.61	62.16	98.73	-36.57
Parallel	0.429	AV	18.74	41.85	60.59	94.97	-34.38
Parallel	0.579	QP	18.85	31.02	49.87	72.38	-22.51
Parallel	0.819	QP	18.99	30.17	49.16	69.36	-20.20

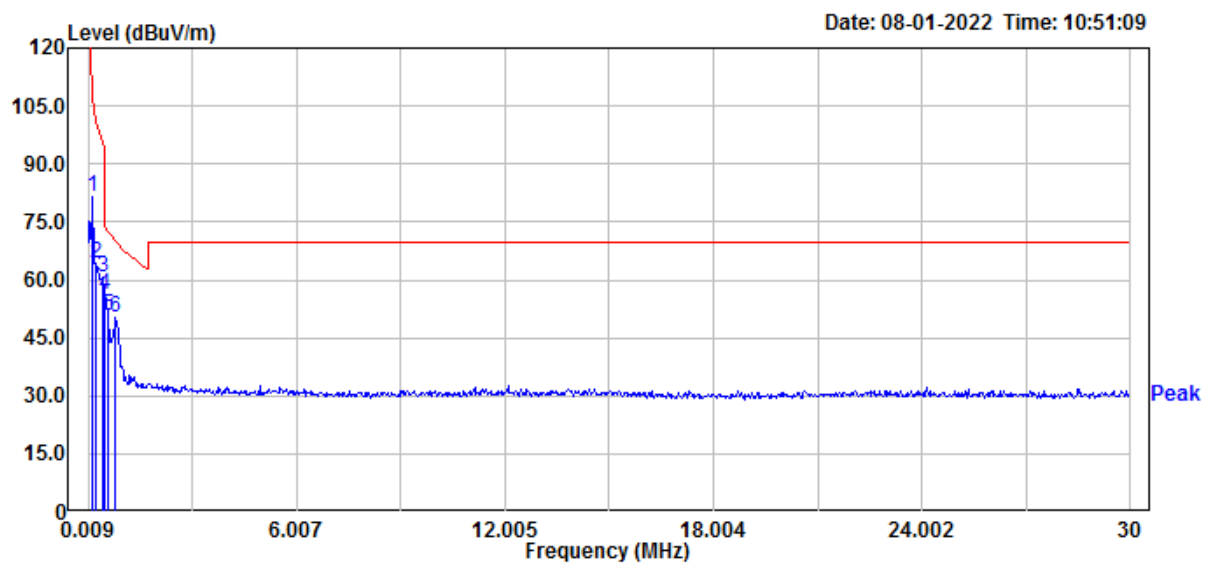
Remark: Corr. Factor = Antenna Factor + Cable Loss



TEST REPORT

Antenna Polarity	Frequency (MHz)	Detector	Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3m (dBμV/m)	Margin (dB)
Ground-parallel	0.129	AV	18.04	63.67	81.71	105.56	-23.85
Ground-parallel	0.219	AV	18.35	46.16	64.51	100.85	-36.34
Ground-parallel	0.399	AV	18.71	42.05	60.76	95.59	-34.83
Ground-parallel	0.489	AV	18.79	37.54	56.33	93.82	-37.49
Ground-parallel	0.549	QP	18.83	32.01	50.84	72.86	-22.02
Ground-parallel	0.789	QP	18.98	31.36	50.34	69.68	-19.34

Remark: Corr. Factor = Antenna Factor + Cable Los

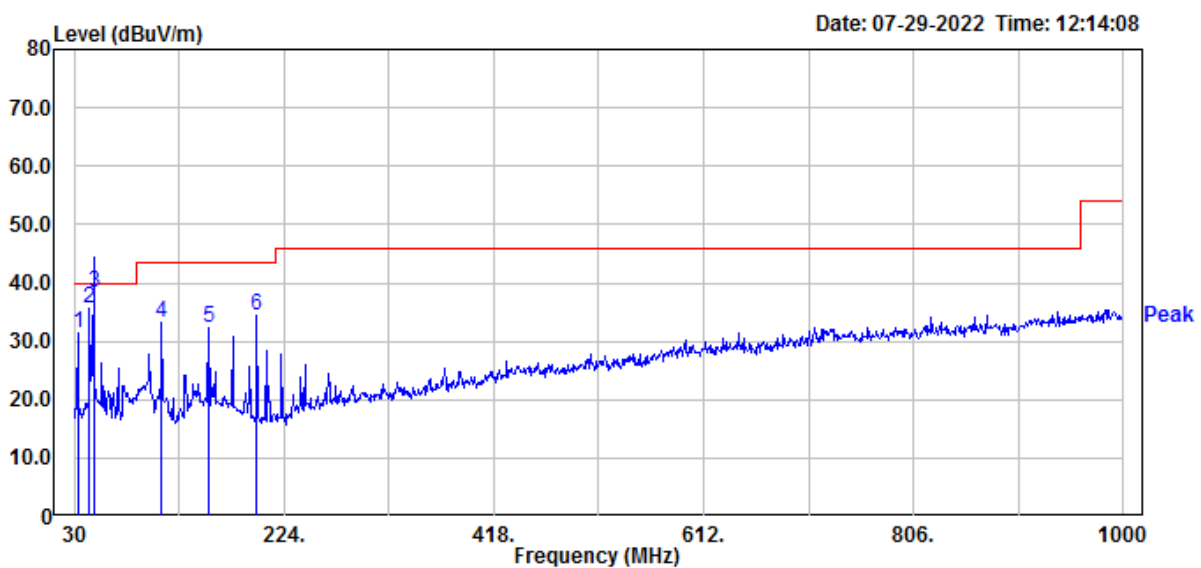


TEST REPORT

Temperature:	29	°C
Relative Humidity:	56	%

Antenna Polarity	Frequency (MHz)	Detector	Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3m (dBμV/m)	Margin (dB)
Vertical	32.91	QP	18.52	12.80	31.32	40.00	-8.68
Vertical	43.58	QP	20.22	15.34	35.56	40.00	-4.44
Vertical	47.46	QP	20.64	17.71	38.35	40.00	-1.65
Vertical	110.51	QP	17.03	16.06	33.09	43.50	-10.41
Vertical	154.16	QP	20.59	11.72	32.31	43.50	-11.19
Vertical	198.78	QP	17.61	16.71	34.32	43.50	-9.18

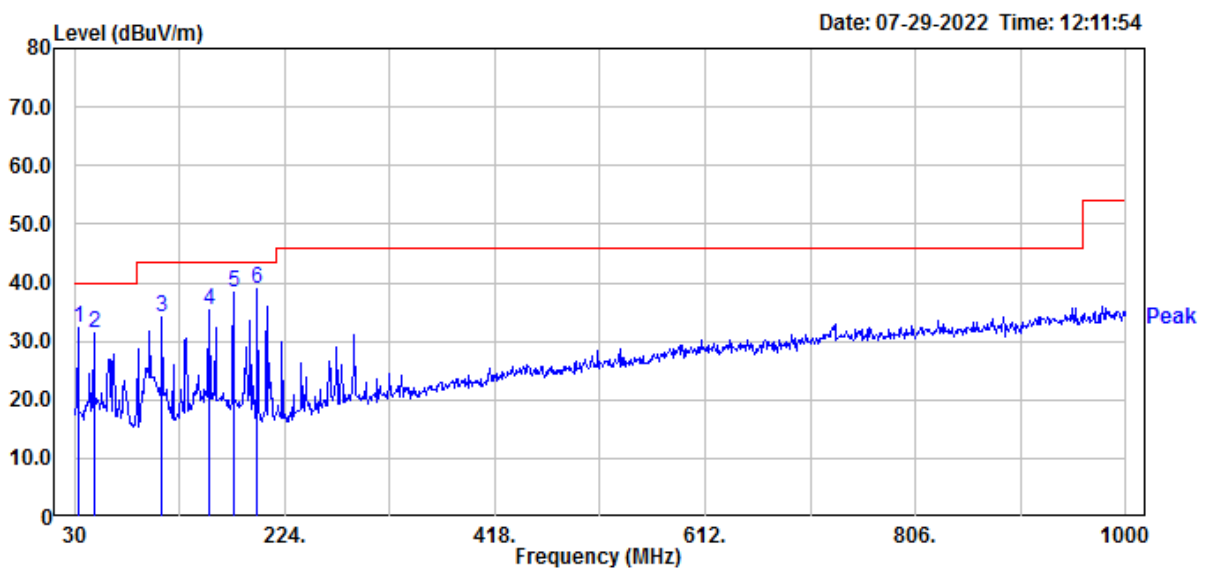
Remark: Corr. Factor = Antenna Factor + Cable Loss



TEST REPORT

Antenna Polarity	Frequency (MHz)	Detector	Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3m (dBμV/m)	Margin (dB)
Horizontal	32.91	QP	18.52	13.69	32.21	40.00	-7.79
Horizontal	47.46	QP	20.64	10.86	31.50	40.00	-8.50
Horizontal	110.51	QP	17.03	16.95	33.98	43.50	-9.52
Horizontal	154.16	QP	20.59	14.72	35.31	43.50	-8.19
Horizontal	176.47	QP	19.50	18.72	38.22	43.50	-5.28
Horizontal	198.78	QP	17.61	21.20	38.81	43.50	-4.69

Remark: Corr. Factor = Antenna Factor + Cable Loss



4. Conducted emission FCC 15.207

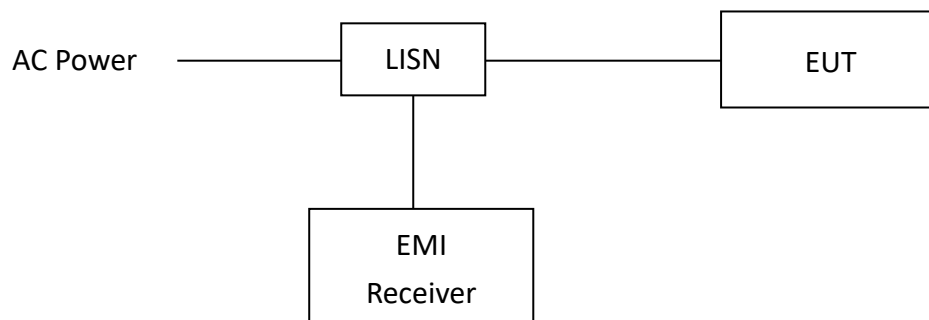
4.1 Measuring instrument setting

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

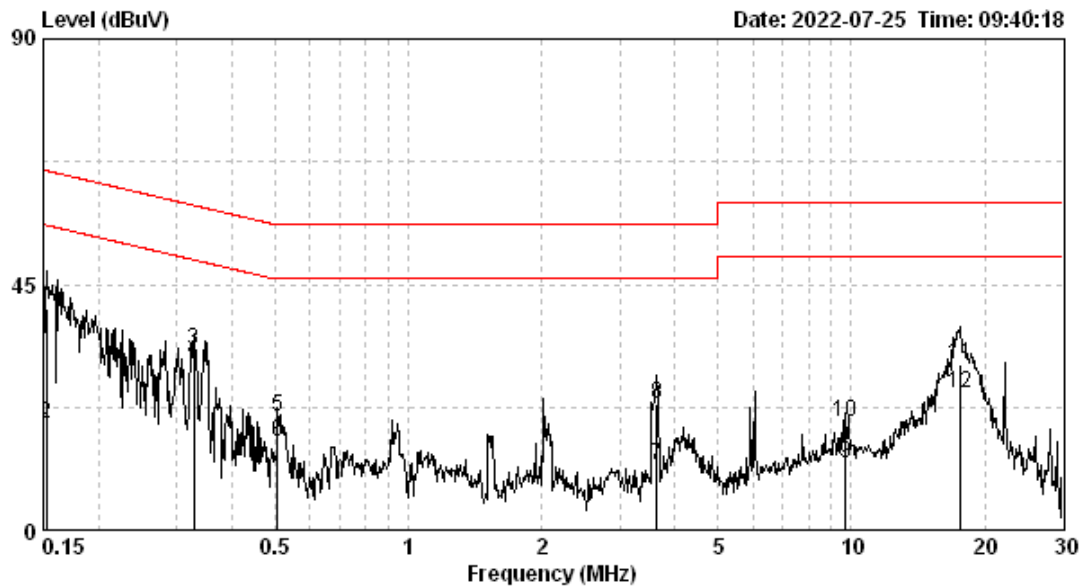


4.4 Limit

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

TEST REPORT

4.5 Test Results



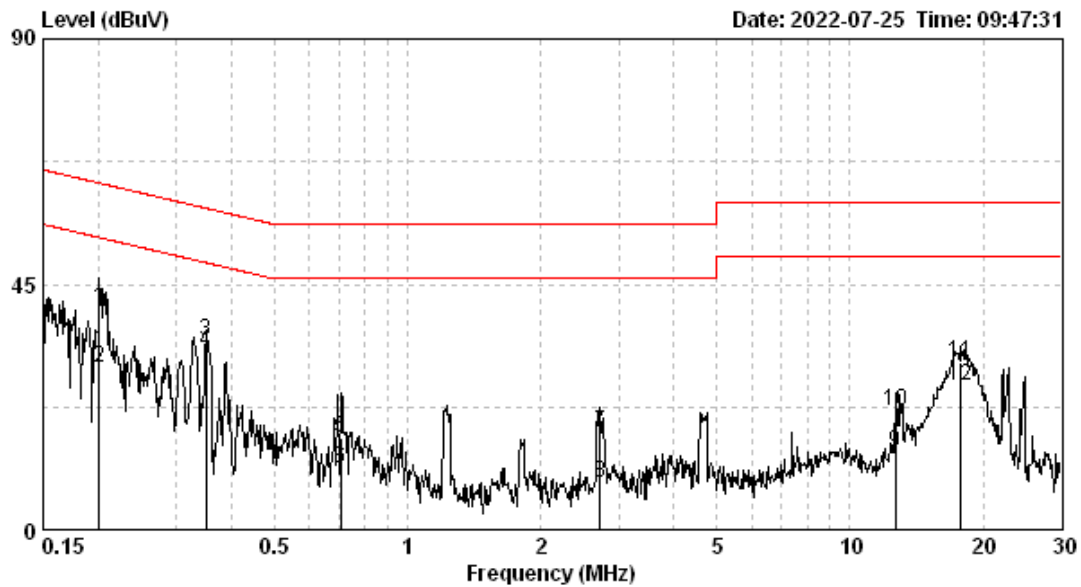
Test voltage :AC 120V 60Hz
Temp. / R.H. :25°C / 59%RH
Atmospheric pressure :1004 hPa

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	0.152	0.14	40.56	40.70	65.87	19.19	19.32	55.87	-25.17	-36.55
LINE	0.329	0.11	32.91	33.03	59.49	30.73	30.84	49.49	-26.46	-18.65
LINE	0.507	0.11	20.75	20.87	56.00	16.06	16.17	46.00	-35.13	-29.83
LINE	3.642	0.16	23.05	23.21	56.00	11.54	11.70	46.00	-32.79	-34.30
LINE	9.705	0.27	19.44	19.71	60.00	12.03	12.29	50.00	-40.29	-37.71
LINE	17.661	0.53	29.78	30.31	60.00	24.41	24.95	50.00	-29.69	-25.05

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 REPORT



Test voltage : AC 120V 60Hz
Temp. / R.H. : 25°C / 59%RH
Atmospheric pressure : 1004 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	0.201	0.12	40.49	40.61	63.58	29.70	29.82	53.58	-22.97	-23.76
NEUTRAL	0.350	0.12	34.38	34.50	58.96	32.63	32.75	48.96	-24.46	-16.21
NEUTRAL	0.705	0.14	16.76	16.90	56.00	11.03	11.17	46.00	-39.10	-34.83
NEUTRAL	2.721	0.19	17.61	17.80	56.00	8.30	8.49	46.00	-38.20	-37.51
NEUTRAL	12.649	0.54	21.22	21.76	60.00	13.68	14.22	50.00	-38.24	-35.78
NEUTRAL	17.755	0.67	29.94	30.62	60.00	25.74	26.42	50.00	-29.38	-23.58

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	ESR7	101822	2021/08/16	2022/08/15
Signal Analyzer	Agilent	N9030A	MY51380492	2021/08/17	2022/08/16
Active Loop Antenna	SCHWARZBECK MESS-ELEKTRONIK	FMZB1519	1519-067	2022/04/13	2023/04/12
Broadband Antenna	SHWARZBECK	VULB 9168	9168-172	2022/01/20	2023/01/19
966-2(A) Cable	SUHNER	SMA / EX 100	N/A	2022/03/04	2023/03/03
966-2(B) Cable	SUHNER	SUCOFLEX 104P	CB0005	2022/03/04	2023/03/03
966-2_3m Semi-Anechoic Chamber	966_2	CEM-966_2	N/A	2022/01/14	2023/01/13
EMI Test Receiver	R&S	ESCI	100018	2021/11/16	2022/11/15
LISN	Schaffner	MN2050D	1586	2021/09/22	2022/09/21
CON-2 Cable	SUHNER	EMCCFD300-B M-NM-6000	170502	2022/04/29	2023/04/28
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
Fundamental emission	4.32 dB
Radiated disturbances from 9kHz~30MHz in a semi-anechoic chamber at a distance of 3m	3.70 dB
Vertically polarized radiated disturbances from 30MHz~1GHz in a semi-anechoic chamber at a distance of 3m	5.16 dB
Horizontally polarized radiated disturbances from 30MHz~1GHz in a semi-anechoic chamber at a distance of 3m	5.02 dB
AC Power Line Conducted Emission	3.08 dB