

Top Victory Electronics(Taiwan) Co. Ltd.

TEST REPORT

Model:

HUB1001****

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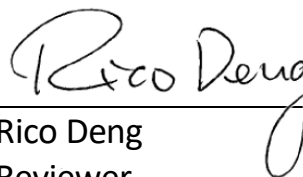


Radio Spectrum TEST REPORT

Applicant:	Top Victory Electronics(Taiwan) Co. Ltd. 10F.,No. 230, Liancheng Rd., Zhonghe Dist., New Taipei City 23553, Taiwan
Product:	Home Monitoring Platform
Model No.:	HUB1001****
Brand Name:	NOMO
FCC ID:	ARS-HUB1001
Test Method/ Standard:	47 CFR FCC Part 15.249 & ANSI C63.10 2013
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
221100106THC-001	Dec. 29, 2022	Original report.

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Summary of Tests

Test	Reference	Results
20dB Bandwidth/Occupied Bandwidth test	15.215(c)	Pass
Radiated Emission test	15.249(c), 15.209	Pass
Conducted Emission of AC Power	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:	Home Monitoring Platform
Model No.:	HUB1001R-01
Operating Frequency:	915MHz
Channel Number:	1 channel
Access scheme:	GFSK
Rated Power:	DC 5V from adapter
Power Cord:	N/A
Sample receiving date:	2022/11/07
Sample condition:	Workable
Test Date(s):	2022/11/23 ~ 2022/12/14

1.2 Adapter information

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

No.	Model no.	Specification
Adapter	S030ABU0500400	I/P: 100-240V~ 50/60Hz 1.0A O/P: 5.0Vdc 4.0A

1.3 Additional information about the EUT

The customer confirmed HUB1001**** is a series model to HUB1001R-01 (EUT).
The "*" can be any alphanumeric character including blank, for marketing differences.

For more detail features, please refer to user's Manual.

1.4 Antenna description

Antenna Gain	: -1.0 dBi
Antenna Type	: Chip Antenna
Connector Type	: Fixed

1.5 Peripherals equipment

Peripherals	Model No.	Serial No.	Data cable
Notebook PC	HP	HP Probook 440 G3	USB shielded cable 1.5m
Fixture	TEXAS INSTRUMENTS	LAUNCHXL-CC1310	Mini USB 0.3m

2. Test specifications

2.1 Test standard

The EUT was performed according to the procedures in FCC Part 15 Subpart C Paragraph 15.249 for non-spread spectrum devices.

The test of radiated measurements according to FCC Part15 Section 15.33(a) had been conducted and the field strength of this frequency band were all meet limit requirement, thus we evaluate the EUT pass the specified test.

2.2 Operation mode

TX mode: EUT use "SmartRF Studio 7 v2.27.0" to transmit.

Mode	Frequency (MHz)	Signal on time(ms)	Signal on & off time(ms)	Duty cycle	Duty Cycle factor
GFSK	915	100	100	1.000	0.000

3. 20dB Bandwidth

3.1 Operating environment

Temperature:	19	°C
Relative Humidity:	59	%
Test date:	2022/12/14	

3.2 Test setup & procedure

Step 1: The 20dB bandwidth was measured using a 50 ohm spectrum analyzer

Step 2: The span range for the SA display shall be between two times and five times the OBW.

Step 3: The nominal IF filter bandwidth (3 dB RBW) should be approximately 1 % to 5 % of the OBW, unless otherwise specified, depending on the applicable requirement.

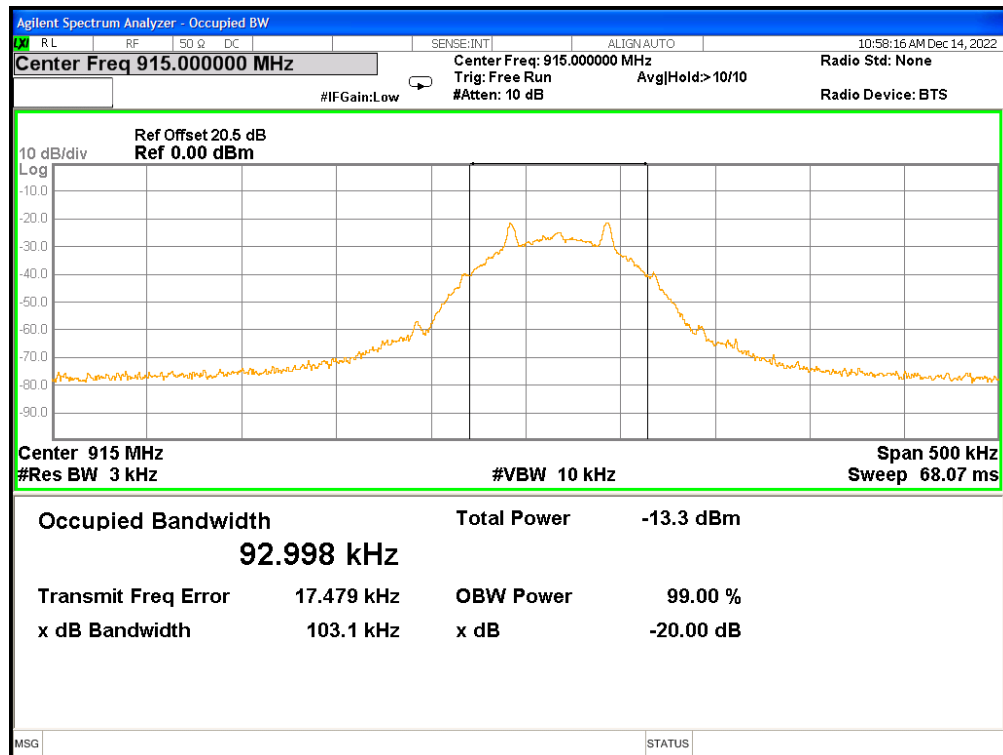
Step 4: The test was performed at 1 channel. The maximum 20dB modulation bandwidth is in the following Table.

3.3 Measured data of modulated bandwidth test results

Mode	Frequency (MHz)	20dB Occupied Bandwidth (MHz)
GFSK	915	0.1031

Please see the plot below.

20dB Bandwidth @ 915MHz



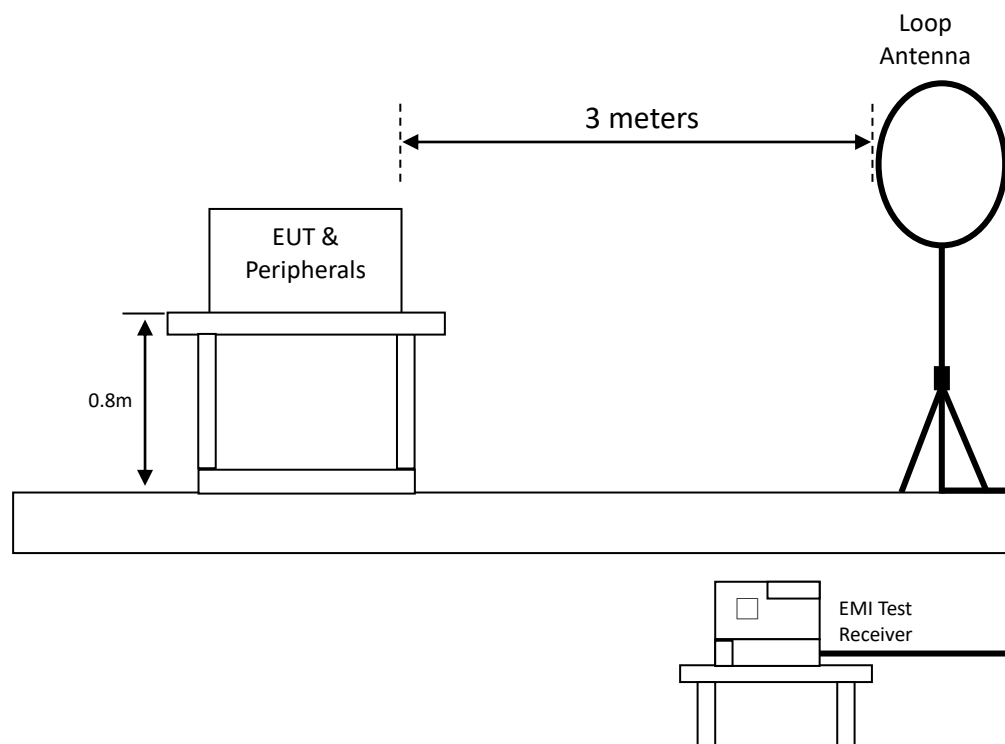
4. Radiated emission test FCC 15.249 (C)

4.1 Operating environment

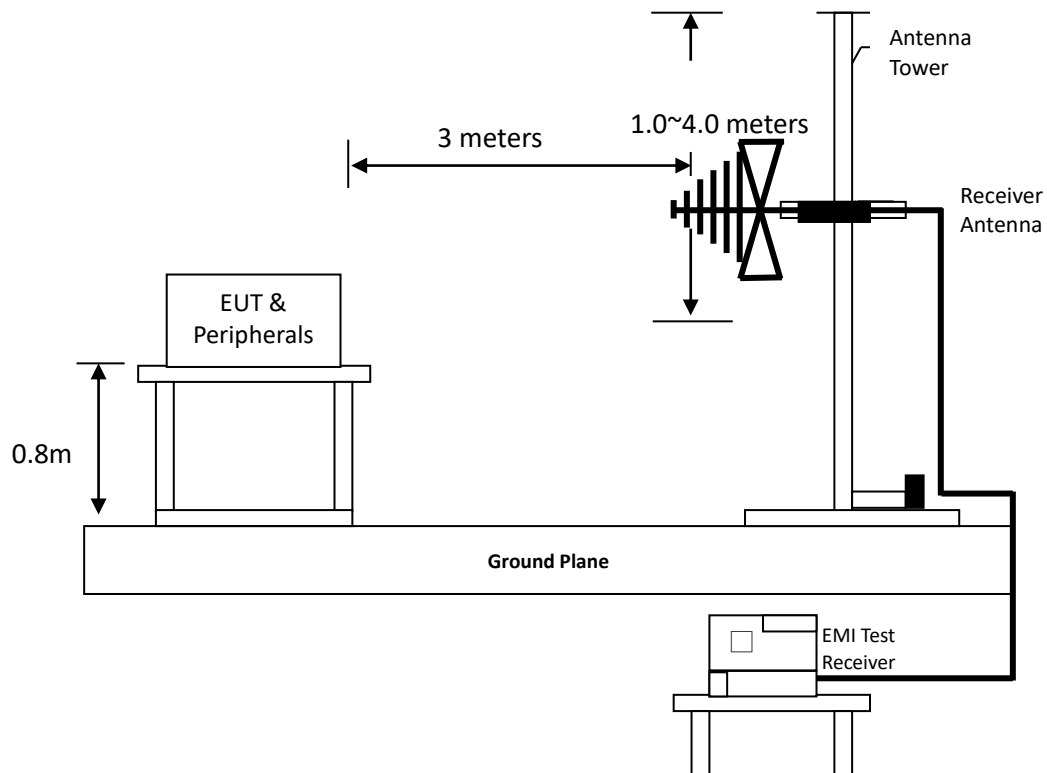
Temperature:	18	°C
Relative Humidity:	61	%
Test date:	2022/12/13	

4.2 Test setup & procedure

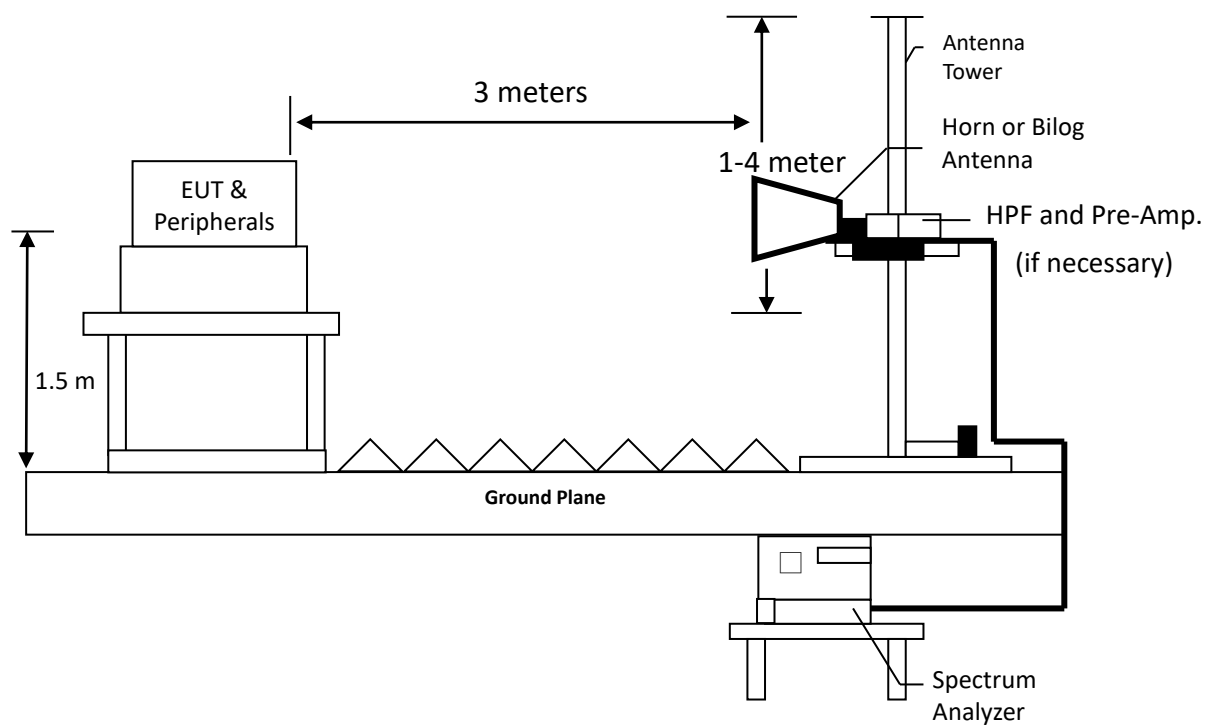
Radiated emission from 9kHz to 30MHz uses Loop Antenna:



Radiated emission below 1GHz using Bilog Antenna



Radiated emission above 1GHz using Horn Antenna



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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 meter reading using inverse scaling with distance.

4.3 Emission limit

4.3.1 Fundamental and harmonics emission limits

Frequency (MHz)	Field Strength of Fundamental		Field Strength of Harmonics	
	(mV/m@3m)	(dBuV/m@3m)	(uV/m@3m)	(dBuV/m@3m)
902-928	50	94	500	54

4.3.2 General radiated emission limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

Frequency MHz	15.209 Limits (dB μ V/m@3m)
30-88	40
88-216	43.5
216-960	46
Above 960	54

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

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4.4 Radiated spurious emission test data

4.4.1 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	0.429	AV	18.74	24.53	43.27	94.96	-51.69
Perpendicular	1.239	QP	19.10	17.19	36.29	65.74	-29.45
Perpendicular	2.858	QP	19.10	13.39	32.49	69.54	-37.05
Perpendicular	5.467	QP	19.72	11.63	31.35	69.54	-38.19
Perpendicular	7.267	QP	20.24	10.55	30.79	69.54	-38.75
Perpendicular	12.485	QP	21.16	10.61	31.77	69.54	-37.77

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	0.699	QP	18.92	17.39	36.31	70.71	-34.40
Parallel	1.269	QP	19.10	16.71	35.81	65.53	-29.72
Parallel	14.555	QP	21.27	12.23	33.50	69.54	-36.04
Parallel	17.674	QP	21.43	12.49	33.92	69.54	-35.62
Parallel	25.861	QP	21.97	13.34	35.31	69.54	-34.23
Parallel	28.800	QP	22.19	17.87	40.06	69.54	-29.48

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	1.209	QP	19.10	18.77	37.87	65.96	-28.09
Ground-parallel	2.408	QP	19.10	13.19	32.29	69.54	-37.25
Ground-parallel	4.118	QP	19.37	12.64	32.01	69.54	-37.53
Ground-parallel	6.757	QP	20.09	11.69	31.78	69.54	-37.76
Ground-parallel	11.646	QP	21.12	10.40	31.52	69.54	-38.02
Ground-parallel	15.694	QP	21.33	10.02	31.35	69.54	-38.19

Remark: Corr. Factor = Antenna Factor + Cable Loss

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

Antenna polarity (H/V)	Frequency (MHz)	Spectrum Analyzer Detector	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
Horizontal	86.26	QP	14.80	22.01	36.81	40.00	-3.19
Horizontal	191.02	QP	17.37	14.36	31.73	43.50	-11.77
Horizontal	215.27	QP	17.23	14.99	32.22	43.50	-11.28
Horizontal	334.58	QP	23.04	10.09	33.13	46.00	-12.87
Horizontal	495.60	QP	26.24	3.89	30.13	46.00	-15.87
Horizontal	644.01	QP	29.56	2.60	32.16	46.00	-13.84

Remark: Corr. Factor = Antenna Factor + Cable Loss

Antenna polarity (H/V)	Frequency (MHz)	Spectrum Analyzer Detector	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
Vertical	79.47	QP	13.52	18.41	31.93	40.00	-8.07
Vertical	191.02	QP	17.37	7.79	25.16	43.50	-18.34
Vertical	372.41	QP	23.91	4.38	28.29	46.00	-17.71
Vertical	551.86	QP	27.27	1.18	28.45	46.00	-17.55
Vertical	644.01	QP	29.56	2.03	31.59	46.00	-14.41
Vertical	723.55	QP	29.88	2.39	32.27	46.00	-13.73

Remark: Corr. Factor = Antenna Factor + Cable Loss

4.4.3 Measurement results: frequency above 1GHz

Mode	Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
GFSK	1855	PK	H	-20.13	64.42	44.29	74	-29.71
	2125	PK	H	-17.74	61.91	44.17	74	-29.83
	2746	PK	H	-15.29	63.00	47.71	74	-26.29
	4573	PK	H	-8.16	52.00	43.84	74	-30.16
	1863	PK	V	-20.04	72.99	52.95	74	-21.05
	1863	AV	V	-20.04	55.59	35.55	54	-18.45
	2125	PK	V	-17.74	70.68	52.94	74	-21.06
	2745	PK	V	-15.30	61.00	45.70	74	-28.30
	4258	PK	V	-9.36	66.00	56.64	74	-17.36
	4258	AV	V	-9.36	53.00	43.64	54	-10.36

Remark: Correction Factor = Antenna Factor + Cable Loss + High Pass Filter Loss - Pre_Amplifier Gain

4.4.4 Measurement results: Fundamental

Mode	Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
GFSK	915	PK	H	32.80	43.52	76.32	114.00	-37.68
	915	PK	V	32.80	42.05	74.85	114.00	-39.15

Remark: Correction Factor = Antenna Factor + Cable Loss

5. AC Power Line Conducted Emission

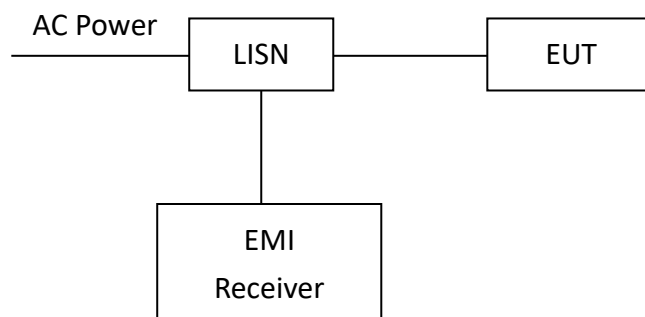
5.1 Measuring instrument setting

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.

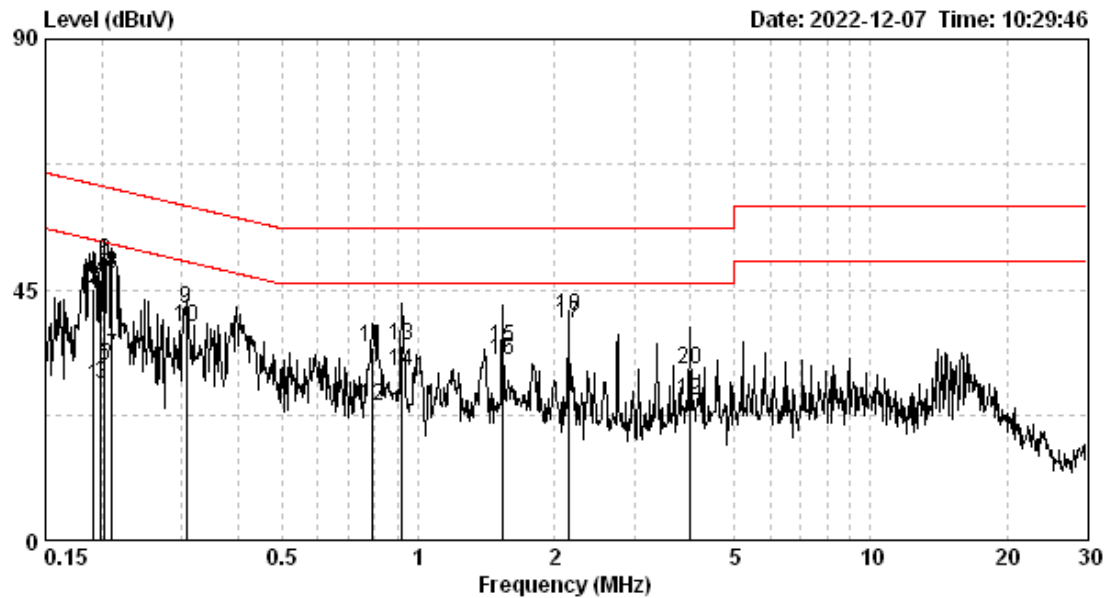
5.3 Test Diagram



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

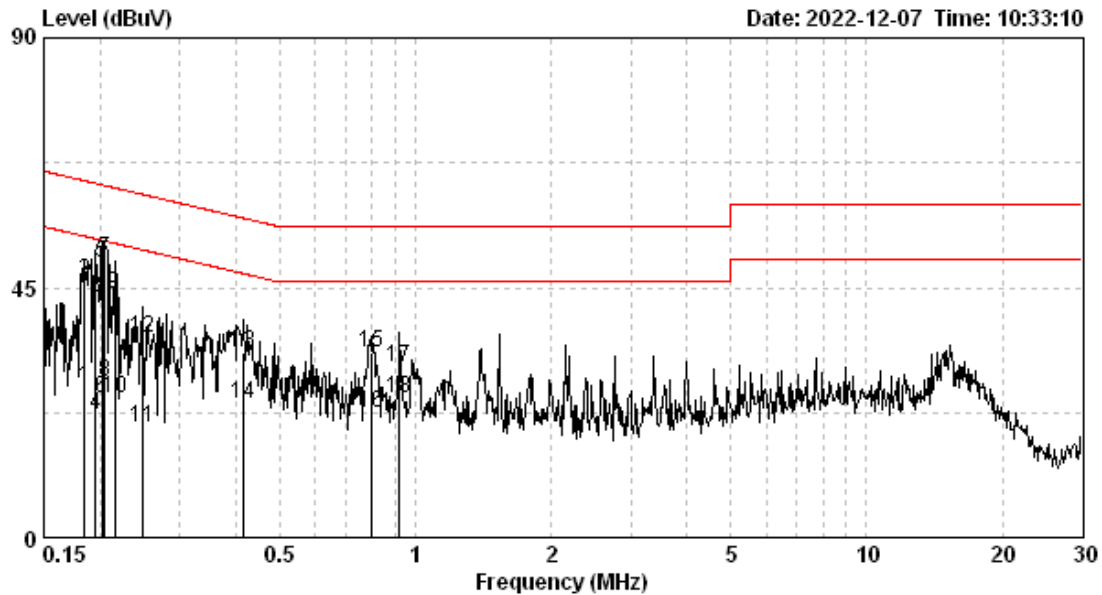


Test voltage : AC 120V/60Hz
Temp. / R.H. : 23°C / 55%RH
Atmospheric pressure : 1006hPa

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	0.191	9.65	35.50	45.16	63.98	17.88	27.53	53.98	-18.82	-26.45
LINE	0.199	9.65	37.09	46.74	63.67	18.36	28.01	53.67	-16.93	-25.66
LINE	0.203	9.65	40.50	50.15	63.49	21.74	31.39	53.49	-13.34	-22.10
LINE	0.211	9.65	38.28	47.93	63.18	23.28	32.93	53.18	-15.25	-20.25
LINE	0.307	9.65	31.82	41.48	60.06	28.57	38.22	50.06	-18.58	-11.84
LINE	0.792	9.68	25.05	34.73	56.00	14.51	24.19	46.00	-21.27	-21.81
LINE	0.923	9.69	25.19	34.88	56.00	20.56	30.25	46.00	-21.12	-15.75
LINE	1.535	9.70	24.91	34.61	56.00	22.52	32.21	46.00	-21.39	-13.79
LINE	2.144	9.70	30.59	40.29	56.00	29.10	38.80	46.00	-15.71	-7.20
LINE	3.985	9.70	20.88	30.58	56.00	15.51	25.21	46.00	-25.42	-20.79

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. : 23°C / 55%RH
Atmospheric pressure : 1006hPa

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	0.184	9.66	36.52	46.18	64.28	17.53	27.19	54.28	-18.11	-27.09
NEUTRAL	0.195	9.66	33.44	43.10	63.80	12.28	21.94	53.80	-20.70	-31.86
NEUTRAL	0.202	9.66	39.77	49.43	63.54	15.34	25.00	53.54	-14.10	-28.54
NEUTRAL	0.205	9.66	40.47	50.13	63.40	18.24	27.90	53.40	-13.27	-25.50
NEUTRAL	0.215	9.66	34.05	43.71	63.01	15.34	25.00	53.01	-19.29	-28.00
NEUTRAL	0.248	9.66	26.32	35.99	61.82	10.11	19.78	51.82	-25.83	-32.04
NEUTRAL	0.417	9.67	23.52	33.19	57.51	14.44	24.11	47.51	-24.32	-23.39
NEUTRAL	0.800	9.70	23.48	33.18	56.00	12.84	22.54	46.00	-22.82	-23.46
NEUTRAL	0.923	9.71	20.83	30.54	56.00	15.23	24.93	46.00	-25.46	-21.07

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	2022/08/09	2023/08/08
Signal Analyzer	Agilent	N9030A	MY51380492	2022/08/09	2023/08/08
Active Loop Antenna	SCHWARZBECK MESS-ELEKTRONIC	FMZB1519	1519-067	2022/04/13	2023/04/12
Bilog Hybrid Antenna	ETC	MCTD 2786B	BLB17J04019 & JB-5-019	2022/10/04	2023/10/03
Horn Antenna	SHWARZBECK	BBHA 9120 D	9120D-456	2022/01/21	2023/01/20
Broadband Amplifier	SGH	SGH118(45dB)	20220105-1	2022/01/07	2023/01/06
Power Meter	Anritsu	ML2495A	0844001	2022/07/04	2023/07/03
Power Sensor	Anritsu	MA2491A	031543	2022/03/07	2023/03/06
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 Cable	SUHNER	SUCOFLEX 104P	9403/4P	2022/11/25	2023/11/24
966-2_3m Semi-Anechoic Chamber	966_2	CEM-966_2	N/A	2022/01/14	2023/01/13
20dB Attenuator	Mini-Circuits	BW-S20W5+	N/A	2022/05/25	2023/05/24
Test software	Audix	e3	V9	NCR	NCR
EMI Test Receiver	R&S	ESCI	100018	2022/11/07	2023/11/06
LISN	R&S	ENV216	101160	2022/07/13	2023/07/12
CON-2 Cable	SUHNER	EMCCFD300-BM- 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
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
Radiated disturbances from 1GHz~18GHz in a semi-anechoic chamber at a distance of 3m	5.17 dB
Vertically polarized Radiated disturbances from 18GHz~26.5GHz in a semi-anechoic chamber at a distance of 1m	2.39 dB
Horizontally polarized Radiated disturbances from 18GHz~26.5GHz in a semi-anechoic chamber at a distance of 1m	2.39 dB
Radiated disturbances from 9kHz~30MHz in a semi-anechoic chamber at a distance of 3m	3.70 dB
Emission on the Band Edge Test	4.32 dB
Occupied Bandwidth	7.78 %
AC Power Line Conducted Emission	3.08 dB