

RADIO PERFORMANCE TEST REPORT

Test Report No. : OT-24N-RWD-015
Reception No. : 2408002803
Applicant : LINKFLOW Co., Ltd.
Address : 3,4F, 54, Nonhyeon-ro 2-gil, Gangnam-gu, Seoul, South Korea
Manufacturer : LINKFLOW Co., Ltd.
Address : 3,4F, 54, Nonhyeon-ro 2-gil, Gangnam-gu, Seoul, South Korea
Type of Equipment : LINKFLOW BOLD
FCC ID. : 2AVCKLFE1300
Model Name : LF-E1300
Multiple Model Name : LF-E1000, LF-E1320, LF-E1340, LF-E2300, LF-E2320, LF-E2340, LF-E3300, LF-E3320, LF-E3340, LF-E2000, LF-E3000
Serial number : N/A
Total page of Report : 27 pages (including this page)
Date of Incoming : September 02, 2024
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SUMMARY

The equipment complies with the regulation; **FCC PART 15 SUBPART C Section 15.247**

This test report only contains the result of a single test of the sample supplied for the examination.

It is not a generally valid assessment of the features of the respective products of the mass-production.

This report is not correlated with the "KS Q ISO/IEC 17025 and KOLAS accreditation" of Korean Laboratory Accreditation Scheme.





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※ Please refer to the Annex section for All test plots

Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-24N-RWD-015	November 12, 2024	Initial Release	All

1. VERIFICATION OF COMPLIANCE

Applicant : LINKFLOW Co., Ltd.
Address : 3,4F, 54, Nonhyeon-ro 2-gil, Gangnam-gu, Seoul, South Korea
Contact Person : Chunghee Lee / Senior Engineer
Telephone No. : +82-10-3332-0211
FCC ID : 2AVCKLFE1300
Model Name : LF-E1300
Brand Name : LINKFLOW
Serial Number : N/A
Date : November 12, 2024

EQUIPMENT CLASS	DTS – DIGITAL TRNSMISSION SYSTEM
E.U.T. DESCRIPTION	LINKFLOW BOLD
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.10: 2013
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC PART 15 SUBPART C Section 15.247 KDB 558074 D01 15.247 Meas Guidance v05r02
Modifications on the Equipment to Achieve Compliance	None
Final Test was Conducted On	3 m, Semi Anechoic Chamber

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

2. TEST SUMMARY

2.1 Test items and results

SECTION	TEST ITEMS	RESULTS
15.247 (a) (2)	Minimum 6 dB Bandwidth	Met the Limit / PASS
15.247 (b) (3)	Maximum Peak Conducted Output Power	Met the Limit / PASS
15.247 (d)	100 kHz Bandwidth Outside the Frequency Band	Met the Limit / PASS
15.247 (d)	Radiated Emission which fall in the Restricted Band	Met the Limit / PASS
15.247 (e)	Peak Power Spectral Density	Met the Limit / PASS
15.209	Radiated Emission Limits	Met the Limit / PASS
15.207	Conducted Limits	Met the Limit / PASS
15.203	Antenna Requirement	Met requirement / PASS

2.2 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standard.

2.3 Related Submittal(s) / Grant(s)

Original submittal only

2.4 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in FCC PART 15 SUBPART C Section 15.247.

2.5 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10: 2013. Radiated testing was performed at a distance of 3 m from EUT to the antenna.

2.6 Test Facility

The Onetech Corp. has been designated to perform equipment testing in compliance with ISO/IEC 17025.

The Electromagnetic compatibility measurement facilities are located at 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea

-. Site Filing:

VCCI (Voluntary Control Council for Interference) – Registration No. R-20122/ C-14617/ G-10666/ T-11842

-. Lab Accreditation:

KOLAS (Korea Laboratory Accreditation Scheme) - Accreditation NO. KT085

ISED (Innovation, Science and Economic Development Canada) – Registration No. Site# 3736A-3

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

3. GENERAL INFORMATION

3.1 Product Description

The LINKFLOW Co., Ltd., Model LF-E1300 (referred to as the EUT in this report) is a LINKFLOW BOLD. The product specification described herein was obtained from product data sheet or user's manual.

Device Type	LINKFLOW BOLD	
Temperature Range	0 °C ~ 40 °C	
Operating Frequency	Bluetooth LE	2 402 MHz ~ 2 480 MHz
	Bluetooth	2 402 MHz ~ 2 480 MHz
	WLAN 2.4 GHz	2 412 MHz ~ 2 462 MHz (802.11b/g/n(HT20)) 2 422 MHz ~ 2 452 MHz (802.11n(HT40))
	WLAN	5 180 MHz ~ 5 240 MHz (802.11a/n(HT20))
	5 150 MHz ~	5 190 MHz ~ 5 230 MHz (802.11n(HT40))
	5 250 MHz Band	5 210 MHz (802.11ac(VHT80))
	WLAN	5 745 MHz ~ 5 825 MHz (802.11a/n(HT20))
	5 725 MHz ~	5 755 MHz ~ 5 795 MHz (802.11n(HT40))
	5 850 MHz Band	5 775 MHz (802.11ac(VHT80))
Modulation Type	Bluetooth LE	GFSK for 1 Mbps, 2 Mbps
	Bluetooth	GFSK for 1Mbps, $\pi/4$ -DQPSK for 2Mbps, 8-DPSK for 3Mbps
	WLAN 2.4 GHz	802.11b: DSSS Modulation (DBPSK/DQPSK/CCK) 802.11g/n(HT20): OFDM Modulation (BPSK/QPSK/16QAM/64QAM)
	WLAN 5 GHz	802.11a/n(HT20)/n(HT40)/ac(VHT80): OFDM Modulation(BPSK/QPSK/16QAM/64QAM)

RF Output Power	Bluetooth LE	1 Mbps	7.19 dBm
		2 Mbps	7.48 dBm
	Bluetooth	1 Mbps	12.23 dBm
		2 Mbps	11.64 dBm
		3 Mbps	11.62 dBm
	WLAN 2.4 GHz	802.11b	17.55 dBm
		802.11g	19.42 dBm
		802.11n(HT20)	19.45 dBm
		802.11n(HT40)	23.44 dBm
	WLAN 5 150 MHz ~ 5 250 MHz Band	802.11a	15.30 dBm
		802.11n(HT20)	15.17 dBm
		802.11n(HT40)	15.82 dBm
		802.11ac(VHT80)	15.50 dBm
	WLAN 5 725 MHz ~ 5 850 MHz Band	802.11a	16.36 dBm
		802.11n(HT20)	16.22 dBm
		802.11n(HT40)	15.99 dBm
		802.11ac(VHT80)	16.65 dBm
Antenna Type	FPCB Antenna		
Antenna Gain	Bluetooth LE	0.32 dBi	
	Bluetooth	0.32 dBi	
	WLAN 2.4 GHz	0.32 dBi	
	WLAN 5 150 MHz ~ 5 250 MHz Band	1.15 dBi	
	WLAN 5 725 MHz ~ 5 850 MHz Band	3.00 dBi	
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)		38.4 MHz	

3.2 Alternative type(s)/model(s); also covered by this test report.

-. The following lists consist of the added model and their differences.

Model Name	Differences	Tested
LF-E1300	Basic Model	☒
LF-E1000, LF-E1320, LF-E1340, LF-E2300, LF-E2320, LF-E2340, LF-E3300, LF-E3320, LF-E3340, LF-E2000, LF-E3000	This model is identical to the basic model except for the model name (Varies depending on B2C, B2B, B2G) only.	☐

Note: 1. Applicant consigns only basic model to test. Therefore this test report just guarantees the units, which have been tested.

2. The Applicant/manufacturer is responsible for the compliance of all variants.

4. EUT MODIFICATIONS

-. None

5. SYSTEM TEST CONFIGURATION

5.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
Main Board	LINKFLOW Co., Ltd.	N/A	N/A

5.2 Peripheral equipment

Defined as equipment needed for correct operation of the EUT, but not considered as tested:

Model	Manufacturer	Description	Connected to
LF-E1300	LINKFLOW Co., Ltd.	LINKFLOW BOLD (EUT)	
RT329OLE	HP	Notebook PC	EUT
PPP009C	CHICONY POWER TECHNOLOGY (Chong Qing) Co., LTD.	AC Adapter	

5.3 Mode of operation during the test

For the testing, software used to control the EUT for staying in continuous transmitting is programmed.

For final testing, the EUT was set at 2 402 MHz, 2 440 MHz, and 2 480 MHz to get a maximum emission levels from the EUT. The EUT was moved throughout the XY, XZ, and YZ planes and the worst case is “YZ” axis, but the worst data was recorded in this report.

-. Frequency / Channel Operations

Channel	Frequency
0	2 402
19	2 440
39	2 480

-. Duty Cycle

Mode	Tx On Time [ms]	Tx Off Time [ms]	Duty Cycle [%]	Correction Factor [dB]
Bluetooth LE [1 Mbps]	2.136	0.364	85.42	0.68
Bluetooth LE [2 Mbps]	1.079	0.796	57.54	2.40

Note – Duty Cycle : (Tx On Time / (Tx On Time + Tx Off Time)) * 100

Correction Factor : 10 * Log(1 / (Duty Cycle / 100))

5.4 Configuration of Test System

- Line Conducted Test:** The EUT was tested in the Transmitting mode. All supporting equipment were connected to another LISN. Preliminary Power line Conducted Emission test was performed by using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions.
- Radiated Emission Test:** Preliminary radiated emissions test were conducted using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions. Final radiated emission tests were conducted at 3 meter Semi Anechoic Chamber.
- The turntable was rotated through 360 degrees and the EUT was tested by positioned three orthogonal planes to obtain the highest reading on the field strength meter. Once maximum reading was determined, the search antenna was raised and lowered in both vertical and horizontal polarization.

5.5 Antenna Requirement

For intentional device, according to section 15.203, 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.

Antenna Construction:

The antenna of the EUT is a FPCB Antenna on the main board in the EUT, so no consideration of replacement by the user.

6. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013. All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95 % level of confidence. The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty (dB)
Conducted Output Power	0.90
Conducted Spurious Emission < 26.5 GHz	1.26
Power Spectral Density	1.20
Line Conducted Disturbance (150 kHz ~ 30 MHz)	2.00
Radiated Disturbance (9 kHz ~ 30 MHz)	3.30
Radiated Disturbance (30 MHz ~ 1 GHz)	4.42
Radiated Disturbance (1 GHz ~ 18 GHz)	5.10
Radiated Disturbance (18 GHz ~ 40 GHz)	5.65

7. PRELIMINARY TEST

7.1 AC Power line Conducted Emissions Tests

During Preliminary Test, the following operating mode was investigated.

Operation Mode	The Worse operating condition (Please check one only)
Transmitting Mode	X

7.2 General Radiated Emissions Tests

During Preliminary Test, the following operating mode was investigated.

Operation Mode	The Worse operating condition (Please check one only)
Transmitting Mode	X

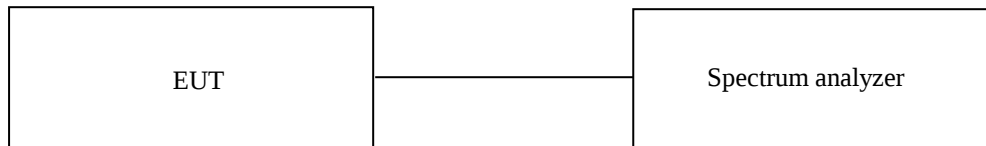
8. MINIMUM 6 dB BANDWIDTH

8.1 Operating environment

Temperature : 24 °C
Relative humidity : 45 % R.H.

8.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz, and peak detection was used. The 6 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 6 dB.



8.3 Test Date

September 09, 2024 ~ October 12, 2024

8.4 Test data for 1 Mbps

CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (kHz)	LIMIT (kHz)	MARGIN (kHz)
Low	2 402.00	664.32	500.00	164.32
Middle	2 440.00	664.32	500.00	164.32
High	2 480.00	664.32	500.00	164.32

Remark. Margin = Measured Value - Limit

8.5 Test data for 2 Mbps

CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (kHz)	LIMIT (kHz)	MARGIN (kHz)
Low	2 402.00	1 138.94	500.00	638.94
Middle	2 440.00	1 148.67	500.00	648.67
High	2 480.00	1 148.67	500.00	648.67

Remark. Margin = Measured Value – Limit

9. MAXIMUM PEAK OUTPUT POWER

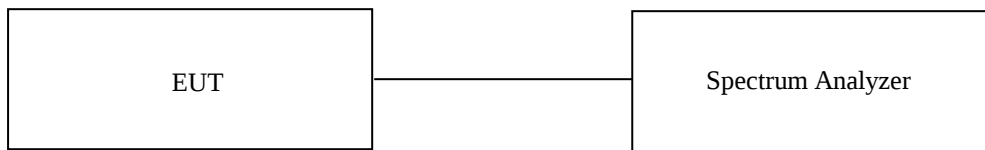
9.1 Operating environment

Temperature : 24 °C
Relative humidity : 45 % R.H.

9.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer.

The resolution bandwidth is set to $\geq$ DTS Bandwidth, the video bandwidth is set to 3 times the resolution bandwidth.



9.3 Test Date

September 09, 2024 ~ October 12, 2024

9.4 Test data for 1 Mbps

-. Test Result : Pass

CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402.00	6.10	30.00	23.90
MIDDLE	2 440.00	6.75	30.00	23.25
HIGH	2 480.00	7.19	30.00	22.81

Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

9.5 Test data for 2 Mbps

-. Test Result : Pass

CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402.00	6.33	30.00	23.67
MIDDLE	2 440.00	7.03	30.00	22.97
HIGH	2 480.00	7.48	30.00	22.52

Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

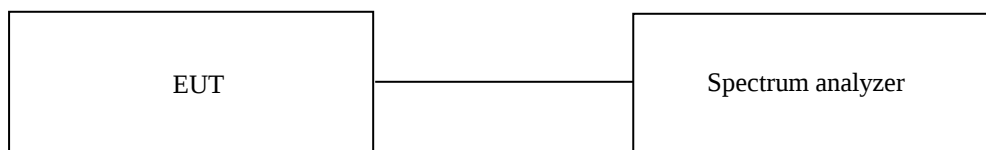
10. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

10.1 Operating environment

Temperature : 25 °C
Relative humidity : 46 % R.H.

10.2 Test set-up for conducted measurement

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz, the video bandwidth is set to 3 times the resolution bandwidth and peak detection was used.



10.3 Test set-up for radiated measurement

The radiated emissions measurements were performed on the 3 m semi anechoic chamber. The EUT was placed on turntable approximately 1.5 m above the ground plane.

The frequency spectrum from 30 MHz to 26.5 GHz was scanned and maximum emission levels at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for horizontal and vertical polarization of the receiving antenna.

10.4 Test Date

September 09, 2024 ~ October 12, 2024

10.5 Test data for conducted emission

For Test data for conducted emission, please refer to the Annex.

10.6 Test data for radiated emission

10.6.1 Radiated Emission which fall in the Restricted Band

10.6.1.1 Test data for 1 Mbps

- . Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode
1 MHz and RMS Detector for Average Mode
- . Video bandwidth : 3 MHz for Peak and Average Mode
- . Measurement distance : 3 m
- . Duty Cycle : 85.42 %
- . Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	AMP Gain	ATT (dB)	Duty Factor (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel											
2 321.53	52.60	Peak	H	27.81	4.62	41.74	6.12	-	49.41	74.00	24.59
2 320.80	40.93	Average	H	27.82	4.62	41.74	6.12	0.68	38.43	54.00	15.57
2 319.24	52.23	Peak	V	27.82	4.62	41.74	6.12	-	49.05	74.00	24.95
2 356.64	41.02	Average	V	27.67	4.63	41.74	6.11	0.68	38.37	54.00	15.63
Test Data for High Channel											
2 483.81	54.89	Peak	H	27.40	4.83	41.73	6.13	-	51.52	74.00	22.48
2 483.65	42.00	Average	H	27.40	4.83	41.73	6.13	0.68	39.31	54.00	14.69
2 483.51	53.97	Peak	V	27.40	4.83	41.73	6.13	-	50.60	74.00	23.40
2 483.61	41.68	Average	V	27.40	4.83	41.73	6.13	0.68	38.99	54.00	15.01

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{AMP Gain} + \text{ATT} + \text{Duty Factor}$$

10.6.1.2 Test data for 2 Mbps

- Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode
1 MHz and RMS Detector for Average Mode
- Video bandwidth : 3 MHz for Peak and Average Mode
- Measurement distance : 3 m
- Duty Cycle : 57.54 %
- Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	AMP Gain	ATT (dB)	Duty Factor (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel											
2 344.24	52.88	Peak	H	27.72	4.63	41.74	6.09	-	49.58	74.00	24.42
2 375.94	41.30	Average	H	27.60	4.65	41.74	6.12	2.40	40.33	54.00	13.67
2 324.57	52.52	Peak	V	27.80	4.62	41.74	6.12	-	49.32	74.00	24.68
2 337.16	41.25	Average	V	27.75	4.63	41.74	6.09	2.40	40.38	54.00	13.62
Test Data for High Channel											
2 483.67	58.34	Peak	H	27.40	4.83	41.73	6.13	-	54.97	74.00	19.03
2 483.51	42.27	Average	H	27.40	4.83	41.73	6.13	2.40	41.30	54.00	12.70
2 483.55	57.80	Peak	V	27.40	4.83	41.73	6.13	-	54.43	74.00	19.57
2 484.01	41.41	Average	V	27.40	4.83	41.73	6.13	2.40	40.44	54.00	13.56

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

Total Level = Reading + Antenna Factor + Cable Loss – AMP Gain + ATT + Duty Factor

10.6.2 Spurious & Harmonic Radiated Emission

10.6.2.1 Test data for 1 Mbps

- . Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
1 MHz for Peak Mode for the emissions outside restricted band
- . Video bandwidth : 3 MHz for Peak and Average Mode
- . Frequency range : 1 GHz ~ 26.5 GHz
- . Measurement distance : 3 m
- . Duty Cycle : 85.42 %
- . Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	AMP Gain	Duty Factor (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel										
4 805.20	48.84	Peak	H	31.20	6.60	41.29	-	45.35	74.00	28.65
4 794.91	37.45	Average	H	31.19	6.60	41.29	0.68	34.63	54.00	19.37
4 804.18	49.21	Peak	V	31.20	6.60	41.29	-	45.72	74.00	28.28
4 803.46	37.31	Average	V	31.20	6.60	41.29	0.68	34.50	54.00	19.50
Test Data for Middle Channel										
4 887.21	49.20	Peak	H	31.27	6.70	41.27	-	45.90	74.00	28.10
4 871.05	37.22	Average	H	31.24	6.69	41.27	0.68	34.56	54.00	19.44
4 874.79	49.08	Peak	V	31.25	6.69	41.27	-	45.75	74.00	28.25
4 870.21	36.94	Average	V	31.24	6.69	41.27	0.68	34.28	54.00	19.72
Test Data for High Channel										
4 962.48	49.25	Peak	H	31.55	6.71	41.25	-	46.26	74.00	27.74
4 955.62	36.96	Average	H	31.52	6.71	41.25	0.68	34.62	54.00	19.38
4 957.86	49.21	Peak	V	31.53	6.71	41.25	-	46.20	74.00	27.80
4 952.33	36.99	Average	V	31.51	6.71	41.25	0.68	34.64	54.00	19.36

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dBμV/m)} - \text{Total Level (dBμV/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{AMP Gain} + \text{Duty Factor}$$

10.6.2.2 Test data for 2 Mbps

- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
1 MHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 3 MHz for Peak and Average Mode
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Duty Cycle : 57.54 %
- Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	AMP Gain	Duty Factor (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel										
4 805.76	50.42	Peak	H	31.20	6.60	41.29	-	46.93	74.00	27.07
4 804.02	37.99	Average	H	31.20	6.60	41.29	2.40	36.90	54.00	17.10
4 809.27	49.39	Peak	V	31.20	6.60	41.29	-	45.90	74.00	28.10
4 803.64	37.73	Average	V	31.20	6.60	41.29	2.40	36.64	54.00	17.36
Test Data for Middle Channel										
4 880.62	49.41	Peak	H	31.26	6.70	41.27	-	46.10	74.00	27.90
4 887.89	37.50	Average	H	31.28	6.70	41.27	2.40	36.61	54.00	17.39
4 881.22	49.07	Peak	V	31.26	6.70	41.27	-	45.76	74.00	28.24
4 874.37	37.34	Average	V	31.25	6.69	41.27	2.40	36.41	54.00	17.59
Test Data for High Channel										
4 963.92	50.31	Peak	H	31.56	6.71	41.25	-	47.33	74.00	26.67
4 962.98	37.38	Average	H	31.55	6.71	41.25	2.40	36.79	54.00	17.21
4 953.47	49.37	Peak	V	31.51	6.71	41.25	-	46.34	74.00	27.66
4 962.52	37.39	Average	V	31.55	6.71	41.25	2.40	36.80	54.00	17.20

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dBμV/m)} - \text{Total Level (dBμV/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{AMP Gain} + \text{Duty Factor}$$

11. PEAK POWER SPECTRAL DENSITY

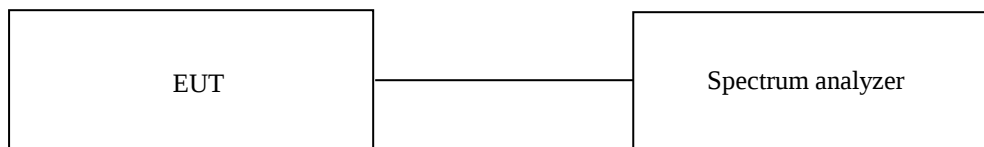
11.1 Operating environment

Temperature : 24 °C
Relative humidity : 45 % R.H.

11.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer.

The resolution bandwidth is set to $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$, the video bandwidth is set to 3 times the resolution bandwidth.



11.3 Test Date

September 09, 2024 ~ October 12, 2024

11.4 Test data for 1 Mbps

-. Test Result : Pass
-. Operating Condition : Continuous transmitting mode

CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 402.00	-10.37	8.00	18.37
Middle	2 440.00	-9.69	8.00	17.69
High	2 480.00	-9.20	8.00	17.20

Remark. Margin = Limit – Measured value

11.5 Test data for 2 Mbps

-. Test Result : Pass
-. Operating Condition : Continuous transmitting mode

CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 402.00	-14.12	8.00	22.12
Middle	2 440.00	-13.43	8.00	21.43
High	2 480.00	-12.66	8.00	20.66

Remark. Margin = Limit – Measured value

12. RADIATED EMISSION TEST

12.1 Operating environment

Temperature : 24 °C
Relative humidity : 45 % R.H.

12.2 Test set-up

The radiated emissions measurements were on the 3 m semi anechoic chamber. The EUT and other support equipment were placed on a non-conductive turntable above the ground plane. The interconnecting cables from outside test site were inserted into ferrite clamps at the point where the cables reach the turntable.

The frequency spectrum from 30 MHz to 26.5 GHz was scanned and emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

12.3 Test Date

September 09, 2024 ~ October 12, 2024

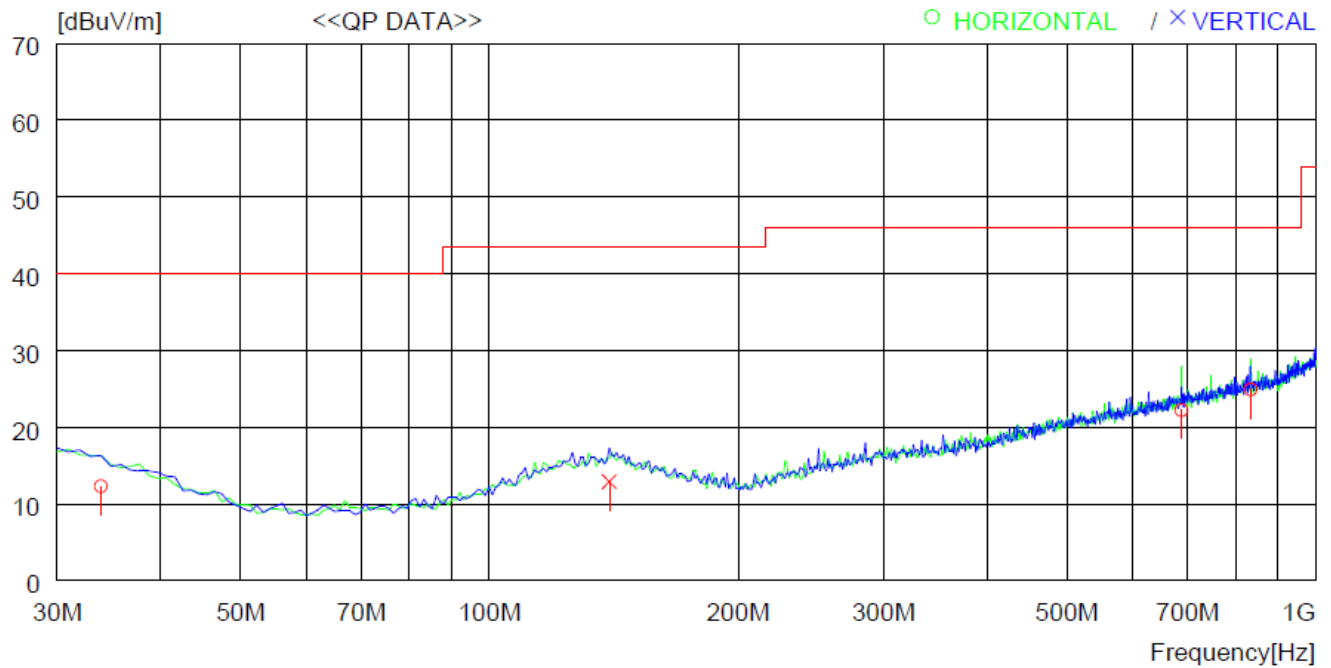
12.4 Test data for 30 MHz ~ 1 000 MHz

Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : LINKFLOW BOLD

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)



No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	[dBuV]	FACTOR	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	33.880	23.9	19.7	0.8	32.1	12.3	40.0	27.7	100	0
2	687.655	25.8	25.4	3.4	32.4	22.2	46.0	23.8	400	359
3	834.121	26.0	27.3	3.8	32.2	24.9	46.0	21.1	100	0
----- Vertical -----										
4	139.610	24.1	19.4	1.5	32.1	12.9	43.5	30.6	400	162

12.5 Test data for Below 30 MHz

- . Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)
- . Frequency range : 9 kHz ~ 30 MHz
- . Measurement distance : 3 m
- . Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
Emission from the EUT more than 20 dB below the limit in each frequency range.									

12.6 Test data for above 1 GHz

- . Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode
1 MHz and RMS Detector for Average Mode
- . Video bandwidth : 3 MHz for Peak and Average Mode
- . Frequency range : 1 GHz ~ 26.5 GHz
- . Measurement distance : 3 m
- . Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
Emission from the EUT more than 20 dB below the limit in each frequency range.									

13. CONDUCTED EMISSION TEST

13.1 Operating environment

Temperature : 24 °C
Relative humidity : 45 % R.H.

13.2 Test set-up

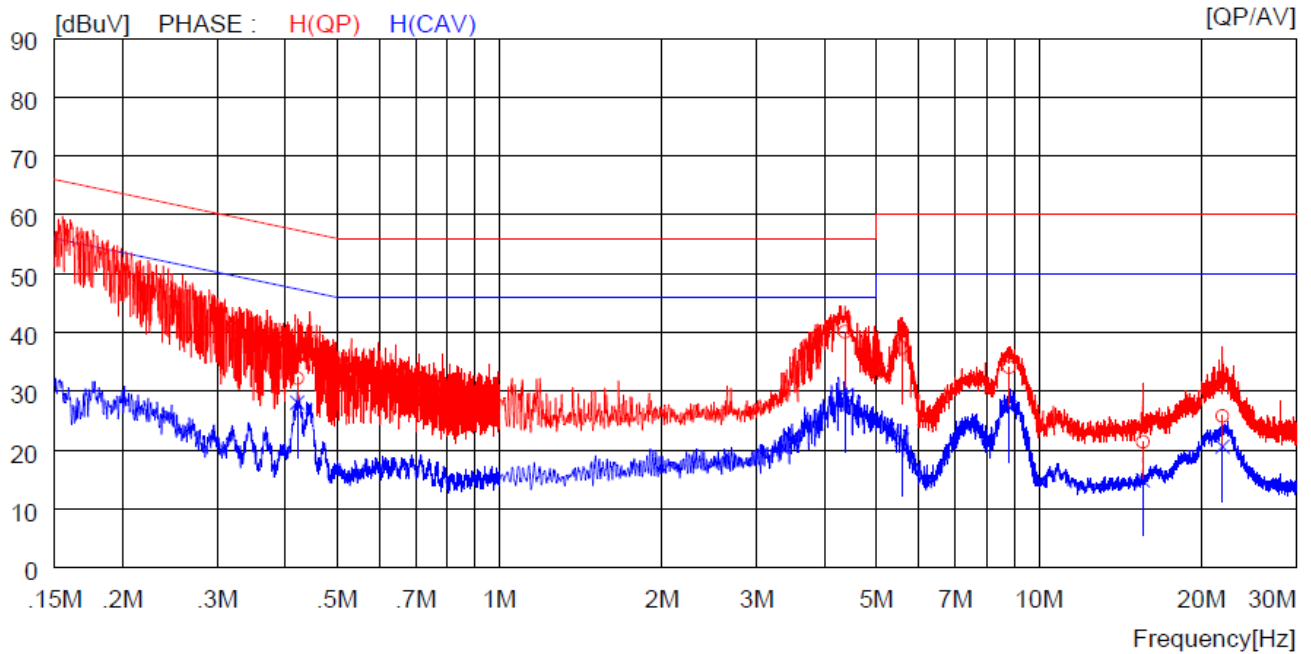
The EUT was placed on a wooden table, 0.8 m height above the floor. Power was fed to the EUT through a 50 Ω / 50 μ H + 5 Ω Artificial Mains Network (AMN). The ground plane was electrically bonded to the reference ground system and all power lines were filtered from ambient.

13.3 Test Date

September 09, 2024 ~ October 12, 2024

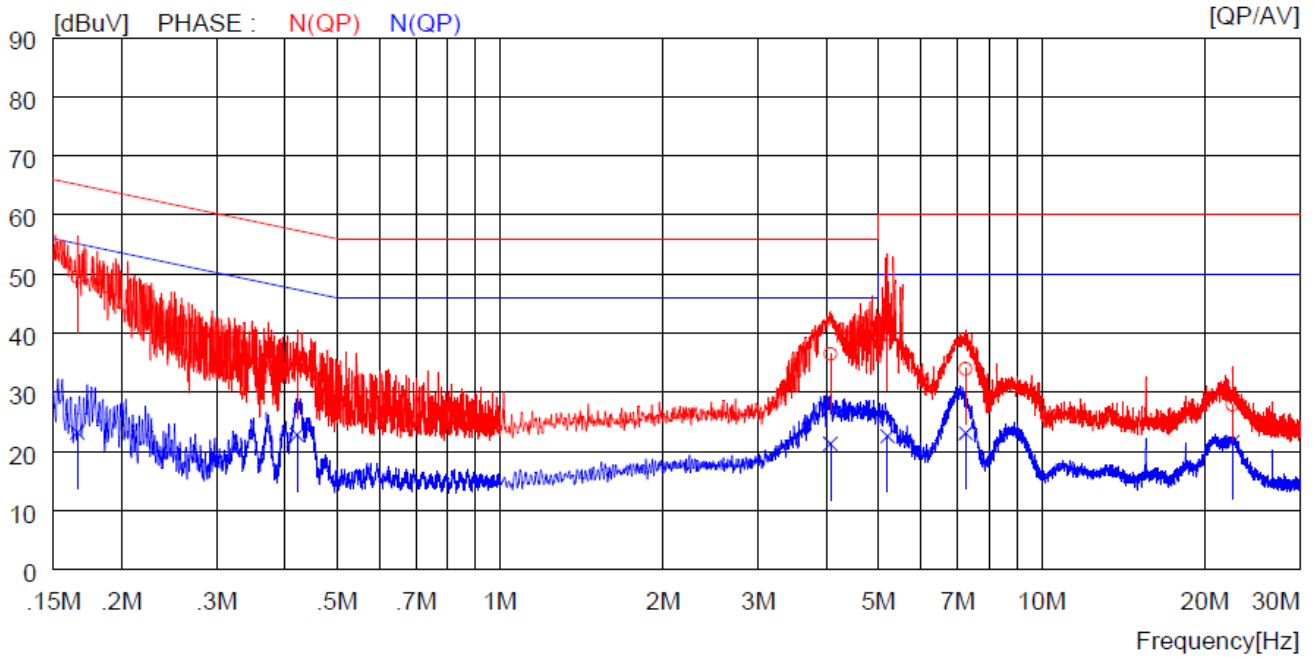
13.4 Test data

- Resolution bandwidth : 9 kHz
- Frequency range : 0.15 MHz ~ 30 MHz
- Tested Line : HOT LINE



NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.42200	22.1	----	10.1	32.2	----	57.4	----	25.2	----	H (QP)
2	4.37200	29.9	----	10.2	40.1	----	56.0	----	15.9	----	H (QP)
3	5.57500	27.1	----	10.3	37.4	----	60.0	----	22.6	----	H (QP)
4	8.81000	23.8	----	10.3	34.1	----	60.0	----	25.9	----	H (QP)
5	15.59000	10.8	----	10.6	21.4	----	60.0	----	38.6	----	H (QP)
6	21.90000	15.1	----	10.7	25.8	----	60.0	----	34.2	----	H (QP)
7	0.42200	----	18.0	10.1	----	28.1	----	47.4	----	19.3	H (CAV)
8	4.37200	----	19.0	10.2	----	29.2	----	46.0	----	16.8	H (CAV)
9	5.57500	----	11.5	10.3	----	21.8	----	50.0	----	28.2	H (CAV)
10	8.81000	----	17.0	10.3	----	27.3	----	50.0	----	22.7	H (CAV)
11	15.59000	----	4.3	10.6	----	14.9	----	50.0	----	35.1	H (CAV)
12	21.90000	----	9.9	10.7	----	20.6	----	50.0	----	29.4	H (CAV)

-. Tested Line : NEUTRAL LINE



NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.16600	39.4	----	10.1	49.5	----	65.2	----	15.7	----	N (QP)
2	0.42200	24.9	----	10.1	35.0	----	57.4	----	22.4	----	N (QP)
3	4.07600	26.3	----	10.2	36.5	----	56.0	----	19.5	----	N (QP)
4	5.19500	29.6	----	10.3	39.9	----	60.0	----	20.1	----	N (QP)
5	7.24000	23.7	----	10.3	34.0	----	60.0	----	26.0	----	N (QP)
6	22.53000	17.2	----	10.7	27.9	----	60.0	----	32.1	----	N (QP)
7	0.16600	----	13.1	10.1	----	23.2	----	55.2	----	32.0	N (CAV)
8	0.42200	----	12.7	10.1	----	22.8	----	47.4	----	24.6	N (CAV)
9	4.07600	----	11.1	10.2	----	21.3	----	46.0	----	24.7	N (CAV)
10	5.19500	----	12.3	10.3	----	22.6	----	50.0	----	27.4	N (CAV)
11	7.24000	----	12.8	10.3	----	23.1	----	50.0	----	26.9	N (CAV)
12	22.53000	----	10.9	10.7	----	21.6	----	50.0	----	28.4	N (CAV)

Remark: Margin (dB) = Limit – Level (Result)

The emission level in above table is included the transducer factor that means insertion loss (LISN), cable loss and attenuator.

14. LIST OF TEST EQUIPMENT

Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
FSV30	Rohde & Schwarz	Signal Analyzer	101199	Jan. 15, 2024 (1Y)
ESR3	Rohde & Schwarz	EMI Test Receiver	102602	Mar. 11, 2024 (1Y)
310N	Sonoma Instrument	Pre-Amplifier	392756	Oct. 16, 2023 (1Y)
SCU18	Rohde & Schwarz	Pre-Amplifier	102266	Jul. 04, 2024 (1Y)
SCU40A	Rohde & Schwarz	Pre-Amplifier	100436	Jan. 23, 2024 (1Y)
DT2000-2t	Innco System	Turn Table	N/A	N/A
MA-4640-XPET	Innco System	Antenna Master	MA4640/652/43100318/P	N/A
CO3000	Innco System	Controller	1026/40960617/P	N/A
FMZB 1513	Schwarzbeck	Loop Antenna	1513-235	Mar. 20, 2024 (2Y)
HLP-2008	TDK	Hybrid Antenna	131316	Mar. 09, 2024 (2Y)
BBHA9120D	Schwarzbeck	Horn Antenna	9120D-1349	Jul. 02, 2024 (1Y)
BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	Jan. 04, 2024 (1Y)
HPF 3GHz	Rohde & Schwarz	High Pass Filter	N/A	Jan. 15, 2024 (1Y)
F-40-10.0-RF	RLC Electronis	High Pass Filter	0427	Mar. 04, 2024 (1Y)
ESCI	Rohde & Schwarz	EMI TEST RECEIVER	101012	Sep. 26, 2024 (1Y)
NSLK8128	Schwarzbeck	AMN	8128216	Mar. 12, 2024 (1Y)
ESH3-Z2	Rohde & Schwarz	PULSE LIMITER	100655	Mar. 12, 2024 (1Y)