Industrial Internet Innovation Center (Shanghai) Co.,Ltd.

RF TEST REPORT

PRODUCT	Wireless Display
BRAND	Fellowes
MODEL	LKOUT W
APPLICANT	Fellowes Inc.
FCC ID	IDH-RMTDSPY
ISSUE DATE	August 22, 2024
STANDARD(S)	FCC Part 2, FCC Part 22, FCC Part 24, FCC Part 27,FCC Part 90

Prepared by: ***Fan Yuhang*** **Reviewed by:** ***Yang Fan*** **Approved by:** ***Zhang Min***

CONTENTS

1. Summary of Test Report

1.1 Test Standard (s)

No.	Test Standard	Title	Version
1	FCC Part 2	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS	--
2	FCC Part 22	PUBLIC MOBILE SERVICES	--
3	FCC Part 24	PERSONAL COMMUNICATIONS SERVICES	--
4	FCC Part 27	MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES	--
5	FCC Part 90	PRIVATE LAND MOBILE RADIO SERVICES	--
NOTE: The standard of FCC Part 2 has not been accredited by A2LA.			

1.2 Reference Documents

No.	Test Standard	Title	Version
1	ANSI/TIA-603-E	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards	2016
2	ANSI C63.26	American National Standard of Procedures for Compliance Testing of Licensed Transmitters Used in Licensed Radio	2015
3	KDB 971168 D01 Power Meas License Digital Systems	Measurement Guidance for Certification of Licensed Digital Transmitters	v03r01
NOTE: The standard of KDB 971168 D01 Power Meas License Digital Systems has not been accredited by A2LA.			

1.3 Sumsmary of Test Results

LTE Band 2

Items	Test Name	Clause in FCC rules	Verdict
1	Output Power	2.1046/24.232(c)	Pass(Note 2)
2	Emission Limit	2.1053/24.238(a)	Pass(Note 2)
3	Frequency Stability	2.1055/24.235	Pass(Note 2)
4	Occupied Bandwidth	2.1049	Pass(Note 2)
5	Emission Bandwidth	2.1049	Pass(Note 2)
6	Band Edge Compliance	2.1051/24.238(a)	Pass(Note 2)
7	Conducted Spurious Emission	2.1051/24.238(a)	Pass(Note 2)
8	Peak to Average Power Ratio	24.232 (d)	Pass(Note 2)

LTE Band 4

Items	Test Name	Clause in FCC rules	Verdict
1	Output Power	2.1046/27.50(d)(4)	Pass(Note 2)
2	Emission Limit	2.1053/27.53(h)	Pass(Note 2)
3	Frequency Stability	2.1055/27.54	Pass(Note 2)
4	Occupied Bandwidth	2.1049	Pass(Note 2)
5	Emission Bandwidth	2.1049	Pass(Note 2)
6	Band Edge Compliance	2.1051/27.53(h)	Pass(Note 2)
7	Conducted Spurious Emission	2.1051/27.53(h)	Pass(Note 2)
8	Peak to Average Power Ratio	27.50(d)(5)	Pass(Note 2)

LTE Band 5

Items	Test Name	Clause in FCC rules	Verdict
1	Output Power	2.1046/22.913(a)	Pass(Note 2)
2	Emission Limit	2.1053/22.917(a)	Pass(Note 2)
3	Frequency Stability	2.1055/22.355	Pass(Note 2)
4	Occupied Bandwidth	2.1049	Pass(Note 2)
5	Emission Bandwidth	2.1049	Pass(Note 2)
6	Band Edge Compliance	2.1051/22.917(a)	Pass(Note 2)
7	Conducted Spurious Emission	2.1051/22.917(a)	Pass(Note 2)
8	Peak to Average Power Ratio	N/A	Pass(Note 2)

LTE Band 12

Items	Test Name	Clause in FCC rules	Verdict
1	Output Power	2.1046/27.50(c)(10)	Pass(Note 2)
2	Emission Limit	2.1053/27.53(g)	Pass(Note 2)
3	Frequency Stability	2.1055/27.54	Pass(Note 2)
4	Occupied Bandwidth	2.1049	Pass(Note 2)
5	Emission Bandwidth	2.1049	Pass(Note 2)
6	Band Edge Compliance	2.1051/27.53(g)	Pass(Note 2)
7	Conducted Spurious Emission	2.1051/27.53(g)	Pass(Note 2)

LTE Band 13

Items	Test Name	Clause in FCC rules	Verdict
1	Output Power	2.1046/27.50(b)(10)	Pass(Note 2)
2	Emission Limit	2.1053/27.53(c)(2)/27.53(f)	Pass(Note 2)
3	Frequency Stability	2.1055/27.54	Pass(Note 2)

4	Occupied Bandwidth	2.1049	Pass(Note 2)
5	Emission Bandwidth	2.1049	Pass(Note 2)
6	Band Edge Compliance	2.1051/27.53(c)(2)/27.53(f)	Pass(Note 2)
7	Conducted Spurious Emission	2.1051/27.53(c)(2)/27.53(f)	Pass(Note 2)

LTE Band 14

Items	Test Name	Clause in FCC rules	Verdict
1	Output Power	2.1046/90.542(a)(7)	Pass(Note 2)
2	Emission Limit	2.1053/90.543(e)/90.543(f)	Pass(Note 2)
3	Frequency Stability	2.1055/90.539	Pass(Note 2)
4	Occupied Bandwidth	2.1049	Pass(Note 2)
5	Emission Bandwidth	90.209(b)	Pass(Note 2)
6	Band Edge Compliance	2.1051/90.543(e)/90.543(f)	Pass(Note 2)
7	Conducted Spurious Emission	2.1051/90.543(e)/90.543(f)	Pass(Note 2)

LTE Band 66

Items	Test Name	Clause in FCC rules	Verdict
1	Output Power	27.50(d)(4)	Pass(Note 2)
2	Emission Limit	2.1053/27.53(h)	Pass(Note 2)
3	Frequency Stability	2.1055/27.54	Pass(Note 2)
4	Occupied Bandwidth	2.1049	Pass(Note 2)
5	Emission Bandwidth	2.1049	Pass
6	Band Edge Compliance	2.1051/27.53(h)	Pass(Note 2)
7	Conducted Spurious Emission	2.1051/27.53(h)	Pass(Note 2)
8	Peak to Average Power Ratio	27.50(d)(5)	Pass(Note 2)

LTE Band 71

Items	Test Name	Clause in FCC rules	Verdict
1	Output Power	27.50(c)(10)	Pass(Note 2)
2	Emission Limit	2.1053/27.53(g)	Pass(Note 2)
3	Frequency Stability	2.1055/27.54	Pass(Note 2)
4	Occupied Bandwidth	2.1049	Pass(Note 2)
5	Emission Bandwidth	2.1049	Pass(Note 2)
6	Band Edge Compliance	2.1051/27.53(g)	Pass(Note 2)
7	Conducted Spurious Emission	2.1051/27.53(g)	Pass(Note 2)

Note1:

This report is a supplement of product 23B013I30452. So the report is not valid without the report of

23B013I30452.

According to client's requirement, a new model (LKOUT W) need to add in the model list. The display unit of the new model has the same PCB layout, schematic diagram, Bom and wireless technology as well as the other electrical construction as the original model. The only difference is that the original model (LKOUT P) is powered by an adapter. However, the new model (LKOUT W) is powered by a junction box. In this report, we only test the worst mode of Radiated Spurious Emission of the new model (LKOUT W). Other test data refer to the report 23B013I30452-RF02-V00.

Industrial Internet Innovation Center (Shanghai) Co., Ltd. only performed test cases which identified with Pass/Fail/Inc result in section 1.3.

Industrial Internet Innovation Center (Shanghai) Co., Ltd. has verified that the compliance of the tested device specified in section 5.3 of this test report is successfully evaluated according to the procedure and test methods as defined in type certification requirement listed in section 6 of this test report.

Note 2:

The test verdict of this item come from the original report.

1.4 Data Provided by Applicant

No.	Item(s)	Data
1	LTE band 2	2 dBi
2	LTE band 4	2 dBi
3	LTE band 5	2 dBi
4	LTE band 12	2 dBi
5	LTE band 13	2 dBi
6	LTE band 14	2 dBi
7	LTE band 66	2 dBi
8	LTE band 71	2 dBi
Note: The data of antenna gain is provided by Antenna specification may affect the validity of the test results in this report, and the impact and consequences of this shall be undertaken by the customer.		

2. General Information of The Laboratory

2.1 Testing Laboratory

Lab Name	Industrial Internet Innovation Center (Shanghai) Co.,Ltd.
Address	Building 4，No. 766，Jingang Road，Pudong，Shanghai，China
Telephone	021-68866880
FCC Registration No.	708870
FCC Designation No.	CN1364

2.2 Laboratory Environmental Requirements

Temperature	15℃~35℃
Relative Humidity	25%RH~75%RH
Atmospheric Pressure	86kPa~106kPa

2.3 Project Information

Project Manager	Xu Yuting
Test Date	August 6, 2024 to August 8, 2024

3. General Information of The Customer

3.1 Applicant

Company	Fellowes Inc.
Address	1789 Norwood Avenue Itasca, Illinois 60143-1095, USA
Telephone	+16306715102

3.2 Manufacturer

Company	Fellowes Inc.
Address	1789 Norwood Avenue Itasca, Illinois 60143-1095, USA
Telephone	+16306715102

3.3 Factory

Company	Fellowes Office Products(Suzhou) Co., Ltd.
Address	No.1 shilin Road,Suzhou NewDistrict,Jiangsu,215151,People's Republic of China
Telephone	N/A

4. General Information of The Product

4.1 Product Description for Equipment under Test (EUT)

Product	Wireless Display
Model	LKOUT W
Date of Receipt	S01: August 6, 2024
EUT ID*	S01
SN/IMEI	N/A
Supported Radio Technology and Bands	WCDMA Band II/IV/V LTE Band 2/4/5/12/13/14/66/71 802.11b/g/n 802.11a/n/ac BLE 4.2 and Bluetooth V2.1 + EDR
Hardware Version	V2.0
Software Version	11.0.1_#7210_10.1_2168A1-V2.0
FCC ID	IDH-RMTDSPY
NOTE1: EUT ID is the internal identification code of the laboratory. NOTE2: Samples in the test report are provided by the customer. The test results are only applicable to the samples received by the laboratory.	

4.2 Description for Auxiliary Equipment (AE)

AE ID*	Description	Model	SN/Remark
AE1	RF Cable	N/A	N/A
NOTE1: AE ID is the internal identification code of the laboratory.			

4.3 Additional Information

Modulation:

Type of modulation	QPSK/16QAM

Band Frequency Range:

Band	Frequency Range
Band 66	1710 – 1780 MHz

Band List:

Band	BW (MHz)	Low Channel	Low Freq. (MHz)	Mid Channel	Mid Freq. (MHz)	High Channel	High Freq. (MHz)
Band 66	1.4	131979	1710.7	132322	1745	132665	1779.3
	3	131987	1711.5	132322	1745	132657	1778.5
	5	131997	1712.5	132322	1745	132647	1777.5
	10	132022	1715	132322	1745	132622	1775
	15	132047	1717.5	132322	1745	132597	1772.5

Band	BW (MHz)	Low Channel	Low Freq. (MHz)	Mid Channel	Mid Freq. (MHz)	High Channel	High Freq. (MHz)
	20	132072	1720	132322	1745	132572	1770

5. Test Configuration Information

5.1 Laboratory Environmental Conditions

5.1.1 Permanent Facilities

Relative Humidity	Min. = 45%, Max. = 55%		
Atmospheric Pressure	101kPa		
Temperature	Normal	Minimum	Maximum
	25℃	-30℃	50℃
Working Voltage of EUT	Normal	Minimum	Maximum
	100-240V	90V	264V

5.2 Test Equipments Utilized

Radiated emission test system

No.	Name	Model	S/N	SW Version	HW Version	Manufacturer	Cal. Date	Cal. Interval
1	Universal Radio Communication Tester	CMU200	123126	V5.2.1	B12	R&S	2023-10-16	1 Year
2	Universal Radio Communication Tester	CMW500	104178	V3.7.20	1206.0600.00	R&S	2023-10-16	1 Year
3	EMI Test Receiver	ESU40	100307	V5.1-24-3	01	R&S	2023-12-19	1 Year
4	TRILOG Broadband Antenna	VULB9163	01345	N/A	N/A	Schwarzbeck	2024-03-29	1 Year
5	Double- ridged Waveguide Antenna	ETS-3117	00135890	N/A	N/A	ETS	2024-03-16	1 Years
6	EMI Test Software	EMC32 V10.35.02	N/A	V10.35.02	N/A	R&S	N/A	N/A
7	Preamplifier	SCU08F1	8320024	N/A	N/A	R&S	2023-10-16	1 year
8	Preamplifier	SCU18	10155	N/A	N/A	R&S	2023-10-16	1 year
9	Antenna	SWB-VUBA 9117	9117-266	N/A	N/A	Schwarzbeck	2023-09-08	1 year
10	Antenna	BBHA9120D	02112	N/A	N/A	Schwarzbeck	2024-07-27	1 year
11	Signal Generator	SMF100A	102314	3.20.390.24	05.10	R&S	2023-10-16	1 year
12	Antenna Tower	TPMDC-LF	N/A	N/A	N/A	Top Precision	N/A	N/A

13	Antenna Tower	TPMDC-HF	N/A	N/A	N/A	Top Precision	N/A	N/A

Anechoic chamber

Fully anechoic chamber by ETS.

5.3 Measurement Uncertainty

Measurement uncertainty for all the testing in this report are within the limit specified in 3IN documents. The detailed measurement uncertainty is defined in 3IN documents.

Measurement Uncertainty of Radiation test

Frequency Range	Uncertainty(dB)
30MHz ≤ f ≤ 1GHz	±5.10
1GHz ≤ f ≤ 18GHz	±5.66
18GHz ≤ f ≤ 40GHz	±5.22

6. Test Results

6.1 Emission Limt

6.1.1 Measurement Limit

According to KDB 971168, a relaxation of the reference bandwidth is often provided for measurements within a specified frequency range at the edge of the authorized frequency block/band. This is often implemented by permitting the use of a narrower RBW (typically limited to a minimum RBW of 1% of the OBW) for measuring the out-of-band emissions without a requirement to integrate the result over the full reference bandwidth.

FCC §27.53(h):

AWS emission limits —

(1) General protection levels. Except as otherwise specified below, for operations in the 1695–1710 MHz, 1710–1755 MHz, 1755–1780 MHz, 1915–1920 MHz, 1995–2000 MHz, 2000–2020 MHz, 2110–2155 MHz, 2155–2180 MHz, and 2180–2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10 (P) dB.

(2) Additional protection levels. Notwithstanding the foregoing paragraph (h)(1) of this section:

(i) Operations in the 2180–2200 MHz band are subject to the out-of-band emission requirements set forth in § 27.1134 for the protection of federal government operations operating in the 2200–2290 MHz band.

(ii) For operations in the 2000–2020 MHz band, the power of any emissions below 2000 MHz shall be attenuated below the transmitter power (P) in watts by at least 70 + 10 log10(P) dB.

(iii) For operations in the 1915–1920 MHz band, the power of any emission between 1930–1995 MHz shall be attenuated below the transmitter power (P) in watts by at least 70 + 10 log10(P) dB.

(iv) For operations in the 1995–2000 MHz band, the power of any emission between 2005–2020 MHz shall be attenuated below the transmitter power (P) in watts by at least 70 + 10 log10(P) dB.

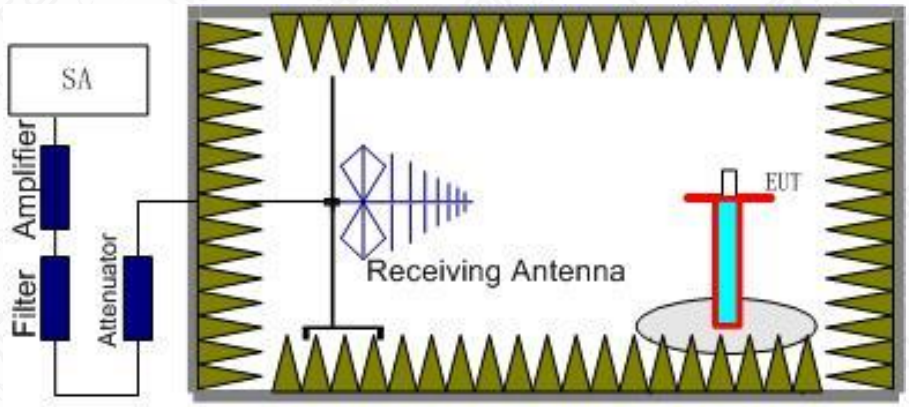
6.1.2 Method of Measurement

The measurements procedures in TIA-603E-2016 are used. This measurement is carried out in fully-anechoic chamber FAC-3.

The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier. The resolution bandwidth is set 1MHz as outlined in Part 27.53(h). The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the LTE Band.

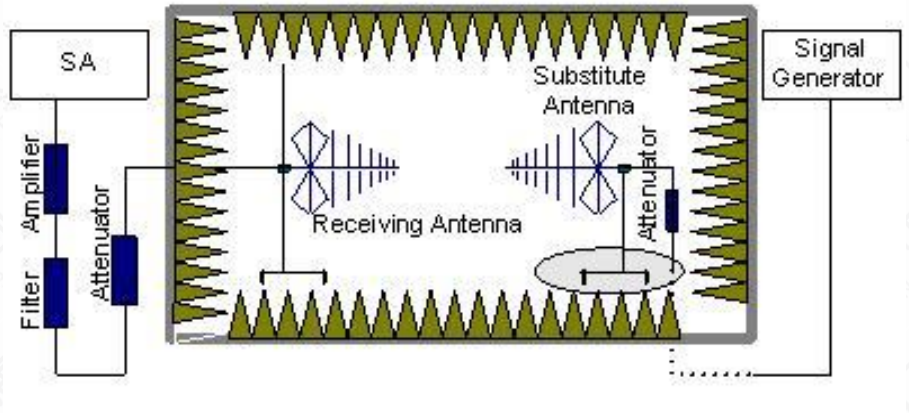
The procedure of radiated spurious emissions is as follows:

Below 1 GHz, EUT was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna. Above 1 GHz, EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna.EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.5m. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all non-harmonic and harmonics of the transmit frequency through the 10th harmonic were measured with peak detector.



2.The EUT is then put into continuously transmitting mode at its maximum power level during the test. And the maximum value of the receiver should be recorded as (Pr).

3.The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.



In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (Pmea) is applied to the input of the substitution antenna. Adjust the level of the signal generator output until the value of the receiver reaches the previously recorded (Pr). The power of signal source (Pmea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

4.The Path loss (Pcl) between the Signal Source with the Substitution Antenna and the Substitution Antenna Gain (Ga) should be recorded after test.

An amplifier should be connected in for the test.

The Path loss (Pcl) is the summation of the cable loss and the gain of the amplifier.

The measurement results are obtained as described below:

Power (EIRP) =Pmea- Pcl + Ga

5.This value is EIRP since the measurement is calibrated using an antenna of known gain (unit: dBi) and known input power.

6.ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.15dBi.

6.1.3 Measurement Results

Radiated emissions measurements were made at the upper, middle, and lower carrier frequencies of the LTE Band.It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well

outside the band and no radiation was seen from a carrier in one block of the LTE Band. Into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this. The evaluated frequency range is from 30MHz to ten times the main frequency signal. The final data result takes the worst pattern data and places it in the report.

Test Frequency range： 30M-26G

Only the worst mode data is provided

RSE-LTE66-L

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Test Result (dBm)	Limit(dBm)	Margin(dBm)	Polarization
3366.0	-51.76	6.2	6.9	-51.06	-13	38.06	H
5119.6	-52.86	7.9	9.6	-51.16	-13	38.16	H
6829.2	-52.86	9.2	10.9	-51.16	-13	38.16	V
8540.4	-53.04	10.3	12.6	-50.74	-13	37.74	H
12218.0	-45.53	12.6	12.3	-45.83	-13	32.83	V
16889.8	-35.77	16.3	12.3	-39.77	-13	26.77	H

RSE-LTE66-M

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Test Result (dBm)	Limit(dBm)	Margin(dBm)	Polarization
3496.0	-54.89	6.4	7.8	-53.49	-13	40.49	H
5229.2	-53	8.0	9.4	-51.6	-13	38.60	V
6965.6	-52.87	9.3	11.1	-51.07	-13	38.07	V
8752.0	-52.12	10.4	12.7	-49.82	-13	36.82	H
10634.0	-48.76	11.6	12.3	-48.06	-13	35.06	V
13443.0	-44.26	13.7	12.3	-45.66	-13	32.66	H

RSE-LTE66-H

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Test Result (dBm)	Limit(dBm)	Margin(dBm)	Polarization
3365.6	-52.22	6.2	6.9	-51.52	-13	38.52	H
5238.4	-52.73	8.0	9.4	-51.33	-13	38.33	H
7229.6	-53.43	9.6	11.4	-51.63	-13	38.63	V
9733.2	-49.96	10.9	12.7	-48.16	-13	35.16	H

12639.4	-45.36	12.8	12.3	-45.86	-13	32.86	H
17995.8	-35.76	16.4	12.3	-39.86	-13	26.86	V

Annex A: Revised History

Version	Revised Content
V0	Initial
V1	Updated the summary of section 1.3

Annex B: Accreditation Certificate

Accredited Laboratory

A2LA has accredited

INDUSTRIAL INTERNET INNOVATION CENTER (SHANGHAI) CO., LTD.

Shanghai, People's Republic of China

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated April 2017*).

Presented this 20th day of September 2023.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3682.01
Valid to February 28, 2025

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

END OF REPORT