RF Exposure Report

Report No.:	MFBCKS-WTW-P23030625
FCC ID:	RF41689A
Test Model:	WS-A01
Received Date:	2023/3/22
Test Date:	2023/7/7
Issued Date:	2023/10/31
Applicant:	KEYENCE CORPORATION
Address:	1-3-14, Higashi-Nakajima, Higashi-Yodogawa-ku, Osaka, 533-8555, Japan
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory
Lab Address:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan
Test Location:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan
FCC Registration / Designation Number:	723255 / TW2022

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Release Control Record

Issue No.	Description	Date Issued
MFBCKS-WTW-P23030625	Original release.	2023/10/31

1 Certificate of Conformity

Product:	Industrial Wireless System
Brand:	KEYENCE
Test Model:	WS-A01
Sample Status:	Engineering sample
Applicant:	KEYENCE CORPORATION
Test Date:	2023/7/7
FCC Rule Part:	FCC Part 2 (Section 2.1091)
Standard:	KDB 447498 D01 General RF Exposure Guidance v06

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : Vito Lung , **Date:** **2023/10/31**

Vito Lung / Specialist

Approved by : , **Date:** **2023/10/31**

May Chen / Manager

2 RF Exposure

2.1 Limits for Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Average Time (minutes)
Limits For General Population / Uncontrolled Exposure				
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	($180/f^2$)*	30
30-300	27.5	0.073	0.2	30
300-1500	…	…	f/1500	30
1500-100,000	…	…	1.0	30

f = Frequency in MHz ; *Plane-wave equivalent power density

2.2 MPE Calculation Formula

$Pd = (Pout*G) / (4*pi*r^2)$

where

Pd = power density in mW/cm^2

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

R = distance between observation point and center of the radiator in cm

2.3 Classification

The antenna of this product, under normal use condition, is at least 24 cm away from the body of the user. So, this device is classified as **Mobile Device**.

2.4 Antenna Gain

Antenna No.	RF Chain No.	Antenna Net Gain (dBi)	Frequency Range (GHz)	Antenna Type	Connector Type
DB1	Chain 0	3.79	2.4~2.4835	PIFA	ipex(MHF)
		5.07	5.15~5.25		
		5.07	5.25~5.35		
		5.32	5.47~5.725		
		5.46	5.725~5.85		
DB2	Chain 1	2.84	2.4~2.4835	PIFA	ipex(MHF)
		4.77	5.15~5.25		
		4.77	5.25~5.35		
		5.63	5.47~5.725		
		5.64	5.725~5.85		
SB1	Chain 0	3.63	5.955-6.415	PIFA	ipex(MHF)
SB2	Chain 1	4.40	5.955-6.415	PIFA	ipex(MHF)

* Detail antenna specification please refer to antenna datasheet and/or antenna measurement report.

2.5 Calculation Result of Maximum Conducted Power

CDD

For Single RF Source

RF Exposure								
Operation Mode	Frequency Band (MHz)	Average Power (mW)	Antenna Gain (dBi)	Maximum EIRP (mW)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)	Test Result
WLAN 2.4 GHz	2412-2462	899.562	3.79	2152.936	24	0.2974	1	Pass
WLAN 5 GHz	5180-5240 5745-5825	627.779	5.64	2300.418	24	0.3178	1	Pass
WLAN 6 GHz	5955-7115	-	-	146.893	24	0.0203	1	Pass

Note: Calculate the EIRP of WLAN 6 GHz from the radiated field strength:
EIRP (dBm) = Radiated field strength (dBuV/m) + 20 x Log(d) − 104.77
d is the measurement distance, in 3 m.
EIRP = 116.9 + 20 x Log(3) − 104.77 = 21.67 dBm (146.893 mW)

For Multiple RF Sources (Simultaneous Operations)

Multiple RF Sources (Simultaneous Operations)							
RF Exposure					Sum of Ratios	Limit of Ratios	Test Result
Operation Mode	Frequency Band (MHz)	Power Density (mW/cm^2)	Limit (mW/cm^2)	Ratio			
WLAN 2.4 GHz	2412-2462	0.2974	1	0.297	0.635	1	Pass
WLAN 5 GHz	5180-5240 5745-5825	0.3178	1	0.318			
WLAN 6 GHz	5955-7115	0.0203	1	0.02			

Beamforming

For Single RF Source

RF Exposure								
Operation Mode	Frequency Band (MHz)	Average Power (mW)	Antenna Gain (dBi)	Maximum EIRP (mW)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)	Test Result
WLAN 2.4 GHz	2412-2462	584.483	6.34	2516.355	24	0.3476	1	Pass
WLAN 5 GHz	5180-5240 5745-5825	620.104	8.56	4451.071	24	0.6149	1	Pass
WLAN 6 GHz	5955-7115	-	-	217.27	24	0.03	1	Pass

Note: Calculate the EIRP of WLAN 6 GHz from the radiated field strength:
EIRP (dBm) = Radiated field strength (dBuV/m) + 20 x Log(d) − 104.77
d is the measurement distance, in 3 m.
EIRP = 118.6 + 20 x Log(3) − 104.77 = 23.37 dBm (217.27 mW)

For Multiple RF Sources (Simultaneous Operations)

Multiple RF Sources (Simultaneous Operations)							
RF Exposure					Sum of Ratios	Limit of Ratios	Test Result
Operation Mode	Frequency Band (MHz)	Power Density (mW/cm^2)	Limit (mW/cm^2)	Ratio			
WLAN 2.4 GHz	2412-2462	0.3476	1	0.348	0.993	1	Pass
WLAN 5 GHz	5180-5240 5745-5825	0.6149	1	0.615			
WLAN 6 GHz	5955-7115	0.03	1	0.03			

NOTE:
1. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

Conclusion:
Source-base time average power is below Exemption Criteria and/or Routine Evaluation MPE thresholds, therefore the device is compliant FCC RF exposure requirement.

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