

## 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
MFCKS-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 :** (Signature), **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 <sup>2</sup> )	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 <sup>2</sup> )*	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

$$P_d = (P_{out} * G) / (4 * \pi * r^2)$$

where

$P_d$  = power density in mW/cm<sup>2</sup>

$P_{out}$  = 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 <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	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:

$$\text{EIRP (dBm)} = \text{Radiated field strength (dBuV/m)} + 20 \times \text{Log}(d) - 104.77$$

d is the measurement distance, in 3 m.

$$\text{EIRP} = 116.9 + 20 \times \text{Log}(3) - 104.77 = 21.67 \text{ dBm (146.893 mW)}$$

#### 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 <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	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 <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	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:

$$\text{EIRP (dBm)} = \text{Radiated field strength (dBuV/m)} + 20 \times \text{Log}(d) - 104.77$$

d is the measurement distance, in 3 m.

$$\text{EIRP} = 118.6 + 20 \times \text{Log}(3) - 104.77 = 23.37 \text{ dBm (217.27 mW)}$$

### 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 <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	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:

- 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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