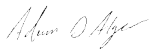
Test Report TR3696C

Equipment Under Test:	AEQ-001JKNF
Requirement(s):	FCC: 2.1091 ISED: RSS-102
Test Date(s):	8/23/2023
Prepared for:	Chicago faucets, Inc. Attn: Larry Himelblau 2100 South Clearwater Drive Des Plaines, IL 60018

Report Issued by: Dylan Rosenfeldt, EMC Engineer

Signature:  Date: 4/10/2024

Report Reviewed by: Adam Alger, Laboratory Manager

Signature:  Date: 4/10/2024

Report Constructed by: Dylan Rosenfeldt, EMC Engineer

Signature:  Date: 8/29/2023

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Ezurio Test Services in Review

The Ezurio laboratory located at W66 N220 Commerce Court Cedarburg, Wisconsin, 53012 USA is recognized through the following organizations:

A2LA – American Association for Laboratory Accreditation

Accreditation based on ISO/IEC 17025:2017 with Electrical (EMC) Scope

A2LA Certificate Number: 1255.01

Scope of accreditation includes all test methods listed herein unless otherwise noted

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Federal Communications Commission (FCC) – USA

Accredited Test Firm Registration Number: 953492

Recognition of two 3 meter Semi-Anechoic Chambers

Government of Canada

Innovation, Science and Economic Development Canada

Accredited U.S. Identification Number: US0218

Recognition of two 3 meter Semi-Anechoic Chambers

1 TEST REPORT SUMMARY

During **8/23/2023** the Equipment Under Test (EUT), **AEQ-001JKNF**, as provided by **Chicago Faucets, Inc.** was tested to the following requirements:

Requirements	Description	Method	Compliant
FCC Part 1.1310, 2.1091	Radio Frequency Radiation Exposure Evaluation	KDB 447498	Yes
ISED RSS-102	Radio Frequency Exposure Compliance of Radiocommunication Apparatus	RSS-102	Yes

Notice:

The results relate only to the item tested as configured and described in this report. Any additional configurations, modes of operation, or modifications made to the equipment under test after the specified test date(s) are at the decision of the client and may not apply to the data seen in this test report.

The decision rule for Pass / Fail assessment to the specification or standard listed in this test report has been agreed upon by the client and laboratory to be as follows:

Measurement Type	Rule
Emissions – Amplitude	1 dB below specified limit
Emissions – Frequency	1% less than the specification
Immunity	Tested at specified level

2 CLIENT INFORMATION

Company Name	Chicago Faucets, Inc.
Contact Person	Larry Himelblau
Address	2100 South Clearwater Drive Des Plaines, IL 60018

2.1 Equipment Under Test (EUT) Information

The following information has been supplied by the client

Product Name	AEQ-001JKNF
Model Number	AEQ-001JKNF
Serial Number	Engineering sample

2.2 Product Description

BLE module used in electronic faucet

2.3 Modifications Incorporated for Compliance

None noted at time of test

2.4 Deviations and Exclusions from Test Specifications

None noted at time of test

2.5 Additional Information

Powered by 6VDC from 120VAC adapter, 6V Battery, or 6.4V rechargeable battery. Device is programmed via FTDI-USB cable. Programmed using STM32CubeMonitor-RF version 2.11.0. FTDI leads and header added to program module.

3 REFERENCES

Publication	Edition	Date	AMD 1	AMD 2
eCFR	-	2023	-	-
RSS-102	5	2015	2021	-
KDB 447498	-	2015	-	-

4 UNCERTAINTY SUMMARY

Using the guidance of the following publications the calculated measurement uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level, using a coverage factor of k = 2.

References
CISPR 16-4-1
CISPR 16-4-2
CISPR 32
ANSI C63.23
A2LA P103
A2LA P103c
ETSI TR 100-028

Measurement Type	Configuration	Uncertainty ±
Radiated Emissions	Biconical Antenna	5.0 dB
Radiated Emissions	Log Periodic Antenna	5.3 dB
Radiated Emissions	Horn Antenna	4.7 dB
AC Line Conducted Emissions	Artificial Mains Network	3.4 dB
Telecom Conducted Emissions	Asymmetric Artificial Network	4.9 dB
Disturbance Power Emissions	Absorbing Clamp	4.1 dB
Radiated Immunity	3 Volts/meter	2.2 dB
Conducted Immunity	CDN/EM/BCI	2.4/3.5/3.4 dB
EFT Burst/Surge	Peak pulse voltage	164 volts
ESD Immunity	15 kV level	1377 Volts

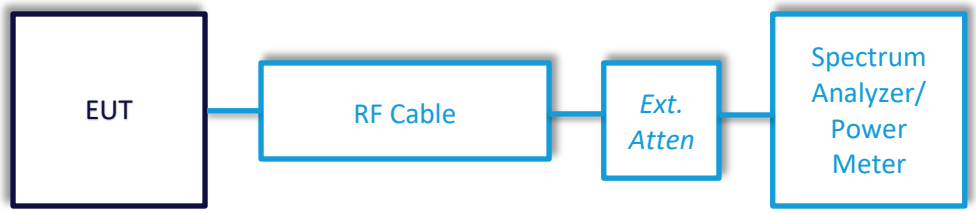
Parameter	ETSI U.C. ±	U.C. ±
Radio Frequency, from F0	$1x10^{-7}$	$0.55x10^{-7}$
Occupied Channel Bandwidth	5 %	2 %
RF conducted Power (Power Meter)	1.5 dB	1.2 dB
RF conducted emissions (Spectrum Analyzer)	3.0 dB	1.7 dB
All emissions, radiated	6.0 dB	5.3 dB
Temperature	1° C	0.65° C
Humidity	5 %	2.9 %
Supply voltages	3 %	1 %

5 TEST DATA

5.1 Antenna Port Conducted Emissions

Description of Measurement	The direct measurement of emissions at the antenna port of the EUT is achieved by use of a RF connection to a spectrum analyzer or power meter. The cable and attenuator factors are loaded into the analyzer or power meter allowing for direct measurement readings without the need for further corrections.
Example Calculations	Measurement (dBm) + Cable factor (dB) + External Attenuator (dB) = Corrected Reading (dBm) Margin (dB) = Limit (dBm) – Corrected Reading (dBm)

Block Diagram



5.1.1 Antenna Port Conducted Emissions – RF Output Power

Channel	Data Rate	Transmit Power Setting	Peak Output Power (dBm)	Limit (dBm)	Margin (dB)
37	BLE 1Mbps	31	6.5	30	23.5
37	BLE 2Mbps	31	6.4	30	23.6
17	BLE 1Mbps	31	6.4	30	23.6
17	BLE 2Mbps	31	6.4	30	23.6
39	BLE 1Mbps	31	6.3	30	23.7
39	BLE 2Mbps	31	6.3	30	23.7

Conducted power measurements from Ezurio Test Report # TR 3696 A

6 FCC SAR EXEMPTION

6.1 SAR Exemption Limit

[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR

- F(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- The value 3.0 is referred to as numeric thresholds

KDB 447498 D01

6.2 Distance

≤5mm

6.3 Power Calculation

Max Power of Channel = 6.5 dBm

Tune-up Tolerance = 1.00 dB

Antenna Gain = 1.5 dBi

Total Power = 6.50 dBm + Tune-up Tolerance + Gain = 9.00 dBm = 8 mW

6.4 SAR Test Exclusion Calculation

$$[\left[\frac{(8mW)}{(5mm)}\right] \times \sqrt{2.48} = 2.52$$

$$2.5 \leq 3.0$$

6.5 Result

The EUT is excluded from SAR testing as 2.5 is less than 3.0.

7 ISED CANADA RF EXPOSURE

7.1 SAR Exemption Limit

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of ≤5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
≤300	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	52 mW
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW

ISED RSS-102

7.2 Distance

15mm

7.3 Power Calculation

Max Power of Channel = 6.5 dBm

Tune-up Tolerance = 1.00 dB

Antenna Gain = 1.5 dBi

Total Power = 6.50 dBm + Tune-up Tolerance + Gain = 9.00 dBm = 8 mW

7.4 SAR Test Exclusion Calculation

The exemption limit at 15mm is 15mW. The total power of the EUT is 8mW.

$8mW \leq 15mW$.

7.5 Result

The EUT is excluded from routine SAR testing at 15mm as 8mW is less than 15mW.

8 REVISION HISTORY

Version	Date	Notes	Person
0	8/29/2023	Initial Draft	Dylan Rosenfeldt
1	11/2/2023	Second Draft	Dylan Rosenfeldt
2	3/25/2024	Updated Header and Footers	Adam Alger
3	4/9/2024	Updated from MPE to SAR exemption	Dylan Rosenfeldt

END OF REPORT