

TEST REPORT

of

FCC/IC MPE REQUIREMENT

Product : IPQ4019 SOM module

Brand Name: EMBUX

Model: SOM4019

Model Difference: N/A

Applicant: EMBUX Technology Co. Ltd.

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Test Performed by:

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Report No.: ISL-23LR0098FMPE
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Test results given in this report apply only to the specific sample(s) tested and are traceable to national or international standard through calibration of the equipment and evaluating measurement uncertainty herein.

The uncertainty of the measurement does not include in consideration of the test result unless the customer required the determination of uncertainty via the agreement, regulation or standard document specification.

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VERIFICATION OF COMPLIANCE

Applicant: EMBUX Technology Co. Ltd.

Product Description: IPQ4019 SOM module

Brand Name: EMBUX

Model No.: SOM4019

Model Difference: N/A

Date of test: August 2, 2023 ~ August 31, 2023

Date of EUT Received: August 2, 2023

We hereby certify that:

All the tests in this report have been performed and recorded in accordance with the standards described above and performed by an independent electromagnetic compatibility consultant, International Standards Laboratory Corp.

The test results contained in this report accurately represent the measurements of the characteristics and the energy generated by sample equipment under test at the time of the test. The sample equipment tested as described in this report is in compliance with the limits of above standards.

Test By:

Kevin Yao

Date: September 01, 2023

Kevin Yao / Senior Engineer

Prepared By:

Gigi Yeh

Date: September 01, 2023

Gigi Yeh / Senior Engineer

Approved By:

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Date: September 01, 2023

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Table of Contents

1. Description of Equipment under Test (EUT).....	4
2. Maximum Permissible Exposure (MPE)	6
3. Evaluation Result:	8

1. Description of Equipment under Test (EUT)

General Information		
Product Name:	IPQ4019 SOM module	
Brand Name:	EMBUX	
Model Name:	SOM4019	
Model Difference:	N/A	
Temperature Range	-40°C to +75°C	
Power Supply:	12Vdc For Adapter	Model: ATS018T-W120U; Supplier: I.T.E
WiFi Information		
WLAN Modular	IPQ4019	
Frequency Range:	WLAN 2.4GHz Band 802.11b/g : 2412MHz~2462MHz 802.11n(HT20) : 2412MHz~2462MHz 802.11n(HT40) : 2422MHz~2452MHz WLAN 5GHz Band U-NII-1 : 5180MHz~5240MHz U-NII-3 : 5745MHz~5825MHz	
Max Output Power:	2412MHz ~ 2462MHz : 24.73dBm(PK) 5180MHz ~ 5240MHz : 16.97dBm(AV) 5745MHz ~ 5825MHz : 28.23dBm(AV)	
Channel number:	WLAN 2.4GHz Band 802.11b/g : 11 802.11n(HT20) : 11 802.11n(HT40) : 9 WLAN 5GHz Band 802.11a U-NII-1 : 4 802.11n(HT20) U-NII-1 : 4 802.11n(HT40) U-NII-1 : 2 802.11ac(VHT20) U-NII-1 : 4 802.11ac(VHT40) U-NII-1 : 2 802.11ac(VHT80) U-NII-1 : 1 802.11a U-NII-3 : 5 802.11n(HT20) U-NII-3 : 5	

	802.11n(HT40)	U-NII-3	:	2
	802.11ac(VHT20)	U-NII-3	:	5
	802.11ac(VHT40)	U-NII-3	:	2
	802.11ac(VHT80)	U-NII-3	:	1
Product HW Version:	Ver. A			
Product SW Version:	N/A			
Product FW Version:	Ver 1.0.9			
Test SW Version:	V5.0.0-00188			
Worst Case:	WLAN 2.4G : 802.11n HT20		WLAN 5G : 802.11n HT40	

	Antenna Type	Brand	Model	Peak Gain	Frequency Range	Connector Type
1	Dipole Antenna	ARISTOTLE	RFA-25-T42-U-M70	2.6dBi 5dBi	2400-2500 MHz 5150-5875 MHz	SMA

According to KDB 662911 D01 MU-MIMO signals could be considered completely uncorrelated for purposes of directional gain computation in case.

Directional gain = G_{ANT}

2. Maximum Permissible Exposure (MPE)

2.1 Standard Applicable

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

This is a Mobile device, the MPE is required.

According to §1.1310 and §2.1091 RF exposure is calculated.

Limits for Maximum Permissive Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
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
1500-15000	/	/	1.0	30

F = frequency in MHz

* = Plane-wave equipment power density

According to RSS 102 issue 5.

2.5.2 Exemption Limits for Routine Evaluation – RF Exposure Evaluation

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $4.49/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

3. Evaluation Result:

Frequency Band (MHz)	Conducted power (dBm)	Antenna gain (dBi)	Tune-Up Tolerance (dB)	EIRP (dBm)	MPE (mW/cm ²)	LIMIT (mW/cm ²)
2412 - 2462	24.73	2.6	1	28.330	0.1354	1
5180 - 5240	16.97	5	1	22.970	0.039	1
5745 - 5825	28.23	5	1	34.230	0.527	1

$$\text{Max Power(mW)} = 10^{((\text{Max Power(dBm)} + \text{Tune-up tolerance(dB)})/10)}$$

$$\text{Result} = \text{Max Power (mW)} / \text{min. distance(mm)} * \sqrt{f(\text{GHz})}$$

~ End ~