



Exposure Evaluation Declaration

FCC ID: 2BAHBINTSHMDV20EC25
Applicant: Intangles Lab Private Limited
Product: System Health Monitoring Device
Model No.: INT-SHMD-V2.0I-EC25AF; INT-SHMD-V2.0E-EC25AF
Brand Name: INTANGLES
FCC Rule Part(s): FCC Part 2.1091
Result: Complies
Received Date: 2023-04-18

Reviewed By:

Sunny Sun

Approved By:

Robin Wu



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standards through the calibration of the equipment and evaluated measurement uncertainty herein.

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Revision History

Report No.	Version	Description	Issue Date	Note
2304RSU037-U5	Rev. 01	Initial Report	2023-05-22	Valid

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1. General Information

1.1. Applicant

Intangles Lab Private Limited

Orville Business Port,9th Floor, Terminal 2 Airport Road,Viman Nagar, Pune,Maharashtra – 411014

1.2. Manufacturer

Intangles Lab Private Limited

Orville Business Port,9th Floor, Terminal 2 Airport Road,Viman Nagar, Pune,Maharashtra – 411014

1.3. Testing Facility

☒	Test Site – MRT Suzhou Laboratory
	Laboratory Location (Suzhou - Wuzhong) D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China
	Laboratory Location (Suzhou - SIP) 4b Building, Liando U Valley, No.200 Xingpu Rd., Shengpu Town, Suzhou Industrial Park, China
	Laboratory Accreditations
	A2LA: 3628.01 FCC: CN1166 VCCI:
	CNAS: L10551 ISED: CN0001 ☐R-20025 ☐G-20034 ☐C-20020 ☐T-20020 ☐R-20141 ☐G-20134 ☐C-20103 ☐T-20104
☐	Test Site – MRT Shenzhen Laboratory
	Laboratory Location (Shenzhen) 1G, Building A, Junxiangda Building, Zhongshanyuan Road West, Nanshan District, Shenzhen, China
	Laboratory Accreditations
	A2LA: 3628.02 FCC: CN1284
	CNAS: L10551 ISED: CN0105
☐	Test Site – MRT Taiwan Laboratory
	Laboratory Location (Taiwan) No. 38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)
	Laboratory Accreditations
	TAF: L3261-190725 FCC: 291082, TW3261
	ISED: TW3261

1.4. Product Information

Product Name	System Health Monitoring Device
Model No.	INT-SHMD-V2.0I-EC25AF; INT-SHMD-V2.0E-EC25AF
Brand Name	INTANGLES
IMEI	867200060788229
WLAN Specification	802.11 b/g/n
Bluetooth Specification	V5.2
GNSS Specification	GPS/GLONASS/BDS/Galileo/SBAS
3GPP Specification	WCDMA Band II/IV/V LTE Band 2/4/5/12/13/14/66/71
Operating Temperature	-40 ~ 85°C
Supply Voltage	8 ~ 32Vdc
Integrated Modular Information	
Cellular Modular Information	Model Number: EC25-AF FCC ID: XMR201808EC25AF
Wi-Fi & BT Modular Information	Model Number: FC41D FCC ID: XMR20211108FC41D
GNSS Modular Information	Model Number: LC86G Brand Name: QUECTEL
Remark:	
1. The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.	

1.5. Antenna Details

Technology	Frequency Range (MHz)	INT-SHMD-V2.0I-EC25AU		INT-SHMD-V2.0E-EC25AU	
		Antenna Type	Max Peak Gain (dBi)	Antenna Type	Max Peak Gain (dBi)
WCDMA Band II LTE Band 2	1850 ~ 1910	FPC	4.98	Glue Stick	2.62
WCDMA Band IV LTE Band 4	1710 ~ 1755		2.97		2.62
WCDMA Band V LTE Band 5	824 ~ 849		-4.12		2.78
LTE Band 12	699 ~ 716		-4.12		2.78
LTE Band 13	777 ~ 787		-4.12		2.78
LTE Band 66	1710 ~ 1780		2.97		2.62
LTE Band 71	663 ~ 698		-4.12		2.78

Technology	Frequency Range (MHz)	Antenna Type	Max Peak Gain (dBi)
Wi-Fi / Bluetooth	2400 ~ 2483.5	PCB	-1.8

Note: All antenna information (Antenna type and Peak Gain) is provided by the manufacturer.

1.6. Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 2.1091 & KDB 447498 D04 Interim General RF Exposure Guidance v01

2. RF Exposure Evaluation

2.1. Test Limits

According to FCC §1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in §1.1307(b)

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)
(A) Limits for Occupational/ Control Exposures				
0.3-3.0	614	1.63	*(100)	≤6
3.0-30	1842/f	4.89/f	*(900/f ²)	<6
30-300	61.4	0.163	1.0	<6
300-1,500	--	--	f/300	<6
1,500-100,000	--	--	5	<6
(B) Limits for General Population/ Uncontrolled Exposures				
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
300-1,500	--	--	f/1500	<30
1,500-100,000	--	--	1.0	<30

f= frequency in MHz. * = Plane-wave equivalent power density.

2.2. MPE Exemptions

For single RF sources (i.e., any single fixed RF source, mobile device, or portable device, as defined in paragraph §1.1307(b)(2) of this section): A single RF source is exempt if:

(Option A) The available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption may not be used in conjunction with other exemption criteria other than those in paragraph §1.1307(b)(3)(ii)(A) of this section.

Medical implant devices may only use this exemption and that in paragraph §1.1307(b)(3)(ii)(A);

(Option B) Or the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). P is given by:

$$P_{th}(mW) = \{ERP_{20cm}(d / 20cm)^x \quad d \leq 20cm$$

$$P_{th}(mW) = \{ERP_{20cm} \quad 20cm < d \leq 40cm$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20cm}\sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20cm}(mW) = \{2040f \quad 0.3GHz \leq f < 1.5GHz$$

$$ERP_{20cm}(mW) = \{3060 \quad 1.5GHz \leq f \leq 6GHz$$

(Option C) Or using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least $\lambda/2\pi$, where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

Table 1 to §1.1307(b)(3)(i)(C) - Single RF Sources Subject to Routine Environmental Evaluation

RF Source Frequency (MHz)	Threshold ERP (watts)
0.3-1.34	1920R ²
1.34-30	3450R ² /f ²
30-300	3.83R ²
300-1,500	0.0128R ² f
1,500-100,000	19.2R ²

For multiple RF sources: Multiple RF sources are exempt if:

(A) The available maximum time-averaged power of each source is no more than 1 mW and there is a separation distance of two centimeters between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required). This exemption may not be used in conjunction with other exemption criteria other than those in paragraph §1.1307(b)(3)(i)(A) of this section. Medical implant devices may only use this exemption and that in paragraph §1.1307(b)(3)(i)(A).

(B) in the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation.

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1$$

Where:

a = number of fixed, mobile, or portable RF sources claiming exemption using paragraph §1.1307(b)(3)(i)(B) of this section for P_{th} , including existing exempt transmitters and those being added.

b = number of fixed, mobile, or portable RF sources claiming exemption using paragraph §1.1307(b)(3)(i)(C) of this section for Threshold ERP, including existing exempt transmitters and those being added.

c = number of existing fixed, mobile, or portable RF sources with known evaluation for the specified minimum distance including existing evaluated transmitters.

P_i = the available maximum time-averaged power or the ERP, whichever is greater, for fixed, mobile, or portable RF source i at a distance between 0.5 cm and 40 cm (inclusive).

$P_{th,i}$ = the exemption threshold power (P_{th}) according to paragraph §1.1307(b)(3)(i)(B) of this section for fixed,

mobile, or portable RF source i .

ERP_j = the ERP of fixed, mobile, or portable RF source j .

$ERP_{th,j}$ = exemption threshold ERP for fixed, mobile, or portable RF source j , at a distance of at least $\lambda/2\pi$ according to the applicable formula of paragraph §1.1307(b)(3)(i)(C) of this section.

$Evaluated_k$ = the maximum reported SAR or MPE of fixed, mobile, or portable RF source k either in the device or at the transmitter site from an existing evaluation at the location of exposure.

$Exposure Limit_k$ = either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable RF source k , as applicable from §1.1310 of this chapter.

2.3. Device Classification

According to the user manual, the antenna of this device is at least 20cm away from the body of the user, this device is classified as a fixed Device. So, the RF exposure evaluation requirements of § 2.1091 for mobile device exposure conditions subject to MPE limits.

2.4. Calculated Result

Product	System Health Monitoring Device
Test Item	RF Exposure Evaluation

Test Mode	Frequency Band (MHz)	Max Tune-up Power (dBm)	Antenna Gain (dBi)	Max ERP (dBm)
Band 2	1850 ~ 1910	25.00	4.98	29.98
Band 4	1710 ~ 1755	25.00	4.98	29.98
Band 5	824 ~ 849	25.00	2.78	25.63
Band 12	699 ~ 716	25.00	2.78	25.63
Band 13	777 ~ 787	25.00	2.78	25.63
Band 14	788 ~ 798	25.00	2.78	25.63
Band 66	1710 ~ 1780	25.00	2.97	27.97
Band 71	663 ~ 698	25.00	2.78	25.63
Wi-Fi	2412 ~ 2462	22.13	-1.80	20.33
Bluetooth	2402 ~ 2480	7.22	-1.80	5.42

Remark:

1. The Max Conducted power was extracted from the Modular tune-up power.
2. The Max ERP (dBm) = Max Conducted Total Power (dBm) + Antenna Gain (dBi) - 2.15.

For single RF source, Option C

Test Mode	Frequency Band (MHz)	$\lambda / 2 \pi$ (m)	R (m)	Max ERP (W)	Threshold ERP (W)
Band 2	1850 ~ 1910	0.0258	0.25	0.9954	1.2000
Band 4	1710 ~ 1755	0.0279	0.25	0.9954	1.2000
Band 5	824 ~ 849	0.0579	0.25	0.3656	0.6592
Band 12	699 ~ 716	0.0683	0.25	0.3656	0.4474
Band 13	777 ~ 787	0.0614	0.25	0.3656	0.6216
Band 14	788 ~ 798	0.0258	0.25	0.3656	0.6304
Band 66	1710 ~ 1780	0.0279	0.25	0.6266	1.2000
Band 71	663 ~ 698	0.0720	0.25	0.3656	0.4243
Wi-Fi	2412 ~ 2462	0.0199	0.25	0.1079	0.7680
Bluetooth	2402 ~ 2480	0.0199	0.25	0.0035	0.7680

Remark: R is from user manual.

For multiple RF sources

The EUT supports Wi-Fi + Cellular simultaneous transmissions.

The Max Simultaneous Transmission = $0.1079/0.7680$ (2.4G) + $0.9954/1.2000$ (Cellular) = $0.9700 < 1$

Therefore, the device qualifies for RF exposure test exemption.

The End