EN IEC 62311:2020
EN 50665:2017

TEST REPORT

FOR

Bluetooth Low Energy and 802.15.4 wireless radio module

Model No.: HM-MT2401, HM-MT2401B

Report No.: E04A24020079H00104

Issue Date: May 06, 2024

Prepared for

Shenzhen HOPE Microelectronics Co., Ltd

30th floor of 8th Building, C Zone Vanke Cloud City, Xili Sub-district, Nanshan, Shenzhen, Guangdong, China

Prepared by

Guangdong Global Testing Technology Co., Ltd.

Room 101-105, 203-210, Building 1, No.2, Keji 8 Road, Songshan Lake Park, Dongguan city, Guangdong, People's Republic of China, 523808

TABLE OF CONTENT

Description Page

TEST REPORT DESCRIPTION

Applicant	:	Shenzhen HOPE Microelectronics Co., Ltd
Manufacturer	:	Shenzhen HOPE Microelectronics Co., Ltd
EUT	:	Bluetooth Low Energy and 802.15.4 wireless radio module
Model No.	:	HM-MT2401
Series Model	:	HM-MT2401B
Brand	:	HOPERF
Rating	:	Input: DC 1.71V-3.8V

Test Procedure Used:

EN IEC 62311:2020
EN 50665: 2017

The device described above is tested by Guangdong Global Testing Technology Co., Ltd. to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. This report shows the EUT to be technically compliant with the EN IEC 62311:2020 and EN 50665: 2017requirements. The test results are contained in this report and Guangdong Global Testing Technology Co., Ltd. is assumed full responsibility for the accuracy and completeness of these tests.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Guangdong Global Testing Technology Co., Ltd.

Date of Test: Mar. 01, 2024 to May 06, 2024

Prepared by: Win Huang / Project Engineer

Reviewer & Authorized Signer: Shawn Wen / General Manager

Modified Information

Version	Summary	Revision Date	Report No.
Ver.1.0	Original Version	/	E04A24020079H00104

1. GENERAL INFORMATION

1.1 Description of Device (EUT)

EUT	:	Bluetooth Low Energy and 802.15.4 wireless radio module
Model Number	:	HM-MT2401
Series Model	:	HM-MT2401B
Model Difference	:	HM-MT2401/19.5dBm, HM-MT2401B/10dBm
Applicant	:	Shenzhen HOPE Microelectronics Co., Ltd
Address	:	30th floor of 8th Building, C Zone Vanke Cloud City, Xili Sub-district, Nanshan, Shenzhen, Guangdong, China
Manufacturer	:	Shenzhen HOPE Microelectronics Co., Ltd
Address	:	30th floor of 8th Building, C Zone Vanke Cloud City, Xili Sub-district, Nanshan, Shenzhen, Guangdong, China
Hardware Version	:	V1.0
Software Version	:	V1.0

1.2 Test Facility

Accreditation Certificate	**A2LA (Certificate No.: 6947.01)** Guangdong Global Testing Technology Co., Ltd. has been assessed and proved to be in compliance with A2LA. **FCC (FCC Designation No.: CN1343)** Guangdong Global Testing Technology Co., Ltd. has been recognized to perform compliance testing on equipment subject to Supplier's Declaration of Conformity (SDoC) and Certification rules **ISED (Company No.: 30714)** Guangdong Global Testing Technology Co., Ltd. has been registered and fully described in a report filed with ISED. The Company Number is 30714 and the test lab Conformity Assessment Body Identifier (CABID) is CN0148.

Note: All tests measurement facilities use to collect the measurement data are located at Room 101-105, 203-210, Building 1, No.2, Keji 8 Road, Songshan Lake Park, Dongguan city, Guangdong, People’s Republic of China, 523808

2. GENERAL PRODUCT INFORMATION

2.1 Basic Restriction

The essential requirements of Directive 2014/53/EU in the article 3.1(a) and the limits must be taken from Council Recommendation 99/519/EC for General Population or form the ICNIRP Guidelines for Occupational Exposure. EN 62479:2010 Generic standard to demonstrate the compliance of low power electronic and electrical apparatus with the basic restrictions related to human exposure to electromagnetic fields. The average power of EUT is less than 20mW then comply with basic restriction (1999/519/EC) without test.

3. TEST RESULT

3.1. EMF Exposure Measurement

3.1.1 Limit

Basic Restrictions

Council Recommendation 99/519/EC Annex II
Basic restrictions for electric, magnetic and electromagnetic fields (0 Hz to 300 GHz)

Frequency range	Magnetic flux density (mT)	Current density (mA/m^2) (rms)	Whole body average SAR (W/kg)	Localized SAR (head and trunk) (W/kg)	Localized SAR (limbs) (W/kg)	Power density, S (W/m^2)
0Hz	40	-	-	-	-	-
>0-1Hz	-	8	-	-	-	-
1–4Hz	-	8/f	-	-	-	-
4Hz–1000Hz	-	2	-	-	-	-
1000Hz–100kHz	-	f/500	-	-	-	-
100kHz–10MHz	-	f/500	0.08	2	4	-
10MHz–10GHz	-	-	0.08	2	4	-
10GHz–300GHz	-	-	-	-	-	10

Note:

1. f is the frequency in Hz.
2. The basic restriction on the current density is intended to protect against acute exposure effects on central nervous system tissues in the head and trunk of the body and includes a safety factor. The basic restrictions for ELF fields are based on established adverse effects on the central nervous system. Such acute effects are essentially instantaneous and there is no scientific justification to modify the basic restrictions for exposure of short duration. However, since the basic restriction refers to adverse effects on the central nervous system, this basic restriction may permit higher current densities in body tissues other than the central nervous system under the same exposure conditions.
3. Because of electrical inhomogeneity of the body, current densities should be averaged over a cross section of 1 cm^2 perpendicular to the current direction.
4. For frequencies up to 100kHz, AV current density values can be obtained by multiplying the rms value by$\sqrt{2}$ (=1.414). For pulses of duration tp the equivalent frequency to apply in the basic restrictions should be calculated as-1/(2tp).
5. For frequencies up to 100kHz and for pulsed magnetic fields, the maximum current density associated with the pulses can be calculated from the rise/fall times and the maximum rate of change of magnetic flux density. The induced current density can then be compared with the appropriate basic restriction.
6. All SAR values are to be averaged over any six-minute period.
7. Localised SAR averaging Mass is any 10g of contiguous tissue; the maximum SAR so obtained should be the value used for the estimation of exposure. These 10g of tissue are intended to be a mass of contiguous tissue with nearly homogeneous electrical properties. In specifying a contiguous mass of tissue, it is recognized that this concept can be used in computational dissymmetry but may present difficulties for direct physical measurements. A simple geometry such as cubic tissue mass can be used provided that the calculated dissymmetric quantities have conservative values relative to the exposure guidelines.
8. For pulses of duration tp the equivalent frequency to apply in the basic restrictions should be calculated

an=1/(2tp). Additionally, for pulsed exposures, in the frequency rage 0.3 to 10GHz and for localized exposure of the head, in order to limit and avoid auditory effects caused by thermoplastic expansion, an additional basic restriction is recommended. This is that the SA should not exceed 2mJ kg-1 averaged over 10g of tissue.

Reference Levels

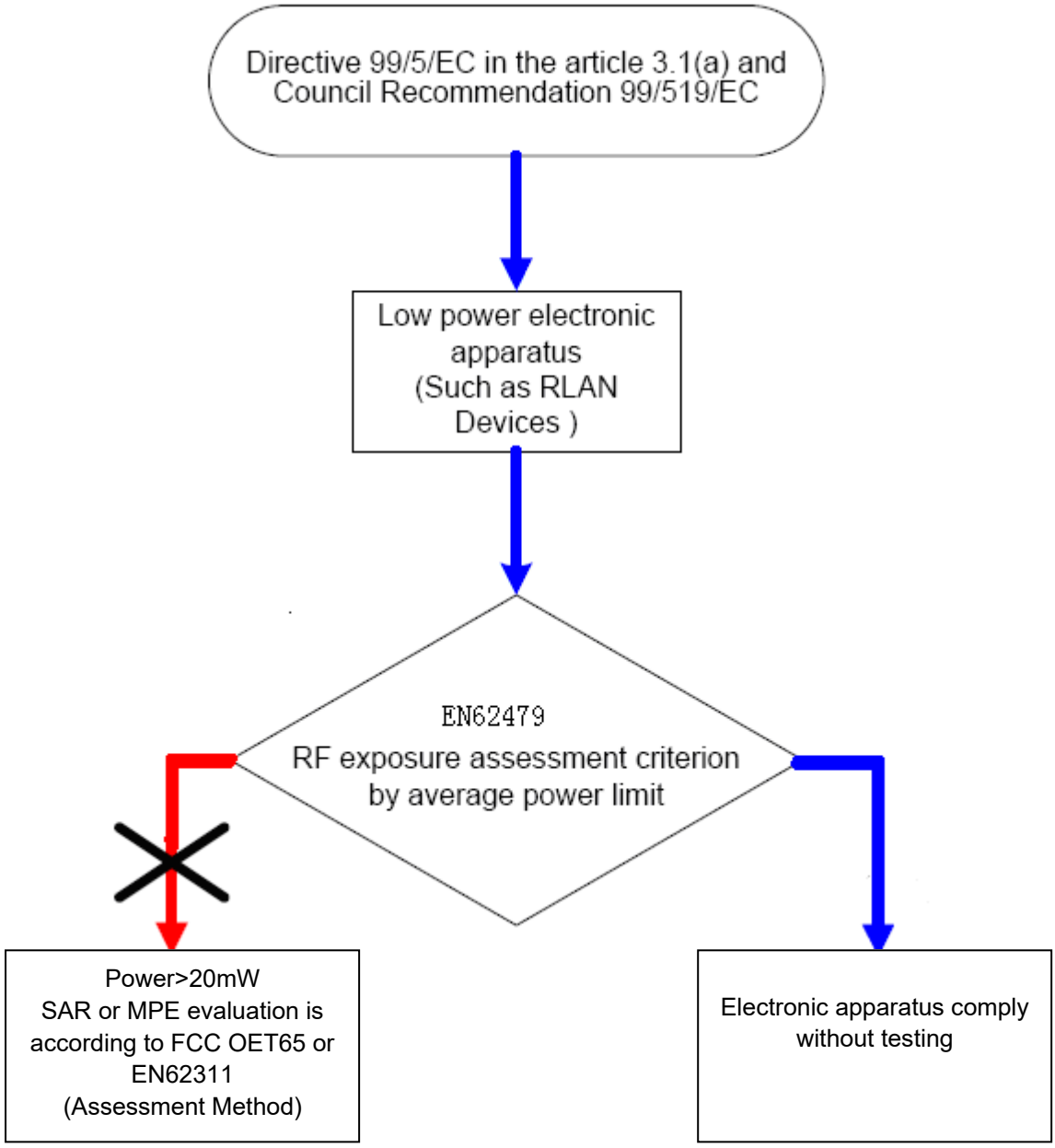
Council Recommendation 99/519/EC Annex III
Reference levels for electric, magnetic and electromagnetic fields (0 Hz to 300GHz)

Frequency range	E-field strength (V/m)	H-field strength (A/m)	B-field (μT)	Equivalent plane wave power density Seq (W/m2)
0-1 Hz	-	3.2×10^4	4×10^4	-
1-8 Hz	10000	$3.2\times10^4/f^2$	$4\times10^4/f^2$	-
8-25 Hz	10000	4000/f	5000/f	-
0.025-0.8 kHz	250/f	4/f	5/f	-
0.8-3 kHz	250/f	5	6.25	-
3-150 kHz	87	5	6.25	-
0.15-1 MHz	87	0.73/f	0.92/f	-
1-10 MHz	$87/f^{1/2}$	0.73/f	0.92/f	-
10-400 MHz	28	0.073	0.095	2
400-2000 MHz	$1.375\ f^{1/2}$	$0.0037\ f^{1/2}$	$0.0046\ f^{1/2}$	f/200
2-300 GHz	61	0.16	0.2	10

Notes:
1. As indicated in the frequency range column.
2. For frequencies between 100kHz and 10 GHz, Seq, E2, H2 and B2 are to averaged over any six-minute period.
3. For frequencies exceeding 10 GHz, Seq, E2, H2, and B2 are averaged over any 68/1.05-minute period(in GHz).
4. No E-field value is provided for frequencies<1 Hz, which are effectively static electric fields. For most people the annoying perception of surface electric charges will not occur at field strengths less than 25 kV/m. Spark discharges causing stress or annoyance should be avoided.

3.1.2. Evaluation Routine

Low Power Electronic Apparatus for RF exposure evaluation routine



3.1.3. EMF Exposure Levels Calculated

3.2 Detailed results

3.2.1 Summary of Results

Frequency Range	MAX EIRP (dBm)	Limit (mW/cm²)	Result (mW/cm²)	Verdict
2402-2480 MHz（BLE）	19.80	1	0.023918	Pass
2405-2480 MHz（802.15.4）	11.82	1	0.003808	Pass

Maximum Simultaneous transmission MPE Ratio for Bluetooth & 802.15.4

Maximum MPE ratio (Bluetooth)	Maximum MPE ratio (802.15.4)	∑ MPE ratios	Limit	Results
0.023918	0.003808	0.027726	1	Pass

3.2.2 MPE Evaluation

S =（P*G ）/ 4πR²
P = Output power to antenna (Watts)
G =Antenna Gain (numeric)
R = distance to the center of radiation of antenna (in meter) = 0.20 m
Note:
1) P (Watts)=(10 ^ (dBm /10))/1000
2) G (Antenna gain in numeric) = 10^ (Antenna gain in dBi /10)
3) π=3.142

Maximum Simultaneous transmission MPE Ratio:

$$\sum_{k=1}^{c} \frac{Evaluated_k}{Exposure\ Limit_k} \leq 1$$

$Evaluated_k$: 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.

3.2.3 Measurement Uncertainty

Extended Uncertainty (k=2) 95% 0.5dB

4.PHOTO OF EUT

Please refer to test report: E04A24020079E00101.

---END OF REPORT---