

RF EXPOSURE REPORT

For

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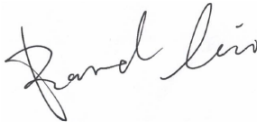
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REPORT REVISION HISTORY

Number of Revisions	Report No.	Version	Issue Date	Description
0	RKSA231222001-00D	R1V1	2024-06-07	Initial Release

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant:	Brightway Innovation Intelligent Technology (Suzhou) Co., Ltd.
Tested Model:	NABE5-BL2
Product Name:	IoT Device
Power Supply:	DC 36V from DC power supply or DC 3.6V from battery
Maximum Output Power:	BLE: 7.72 dBm GPRS 850: 32.98dBm EGPRS 850: 28.56 dBm GPRS 1900: 28.42dBm EGPRS 850: 25.35 dBm LTE NB-IOT: LTE Band 2: 20.08 dBm LTE Band 4: 20.55 dBm LTE Band 5: 20.72 dBm LTE Band 12: 20.74 dBm LTE Band 13: 20.61 dBm LTE CAT-M: LTE Band 2: 22.26 dBm LTE Band 4: 22.24 dBm LTE Band 5: 22.16 dBm LTE Band 12: 22.16 dBm LTE Band 13: 22.08 dBm
RF Function:	BLE (1Mbps), GPRS/EGPRS, LTE CAT-M, NB-IOT
Operating Band/Frequency:	BLE (1Mbps): 2402-2480 MHz GSM850: 824-849 MHz(TX), 869-894 MHz(RX) GSM1900: 1850-1910MHz(TX), 1930-1990MHz(RX) LTE Band 2: 1850-1910 MHz(TX), 1930-1990MHz(RX) LTE Band 4: 1710-1755 MHz(TX), 2110-2155MHz(RX) LTE Band 5: 824-849 MHz(TX), 869-894 MHz(RX) LTE Band 12: 699-716 MHz(TX), 729-746 MHz(RX) LTE Band 13: 777-787 MHz(TX), 746-756 MHz(RX)
Channel Number:	BLE: 40
Channel Separation:	BLE: 2 MHz
Modulation Type:	BLE: GFSK GPRS/EGPRS: GMSK,8PSK LTE CAT-M: QPSK, 16QAM NB-IOT: BPSK,QPSK
Antenna Type:	PIFA Antenna
★Maximum Antenna Gain:	BLE (1Mbps): 2.54 dBi GSM850: -3.96dBi GSM1900: 1.88dBi LTE Band 2: 1.88dBi LTE Band 4: 1.87dBi LTE Band 5: -3.96dBi LTE Band 12: -2.69dBi LTE Band 13: -0.2dBi

Note: The maximum antenna gain was declared by the manufacturer.

All measurement and test data in this report was gathered from production sample serial number: RKSA231222001-1 (Assigned by the BACL (Kunshan). The EUT supplied by the applicant was received on 2023-12-22.)

FCC §1.1310 & §2.1091 - MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart §2.1091 and subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm²)	Averaging Time (minutes)
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
1500-100,000	/	/	1.0	30

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

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

Calculated Formulary:

Predication of MPE limit at a given distance

$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm²);

P = power input to the antenna (in appropriate units, e.g., mW);

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

Calculation Data:

Mode		Frequency Range (MHz)	Antenna Gain		Tune-up Output Power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)	MPE Ratio
			(dBi)	(numeric)	(dBm)	(mW)				
BLE		2402-2480	2.54	1.79	8	6.31	20	0.0022	1.0	0.0022
GSM850 (GPRS/EGPRS)		824-849	-3.96	4.0	27	501.19	20	0.0399	0.5493	0.0399
PCS1900 (GPRS/EGPRS)		1850-1910	1.88	1.54	24	251.19	20	0.0769	1.0	0.0769
LTE NB-IOT	LTE Band 2	1850-1910	1.88	1.54	20.5	112.20	20	0.0344	0.0428	0.0344
	LTE Band 4	1710-1755	1.87	1.54	21.0	125.89	20	0.0386	0.0391	0.0386
	LTE Band 5	824-849	-3.96	1.54	21.0	125.89	20	0.0386	0.5493	0.0386
	LTE Band 12	699-716	-2.69	0.54	21.0	125.89	20	0.0135	0.0296	0.0135
	LTE Band 13	777-787	-0.2	0.95	21.0	125.89	20	0.0238	0.518	0.0238
LTE CAT-M	LTE Band 2	1850-1910	1.88	1.54	22.5	177.83	20	0.0545	0.0679	0.0545
	LTE Band 4	1710-1755	1.87	1.54	22.5	177.83	20	0.0545	0.0552	0.0545
	LTE Band 5	824-849	-3.96	0.04	22.5	177.83	20	0.0141	0.5493	0.0141
	LTE Band 12	699-716	-2.69	0.54	22.5	177.83	20	0.0191	0.0418	0.0191
	LTE Band 13	777-787	-0.2	0.95	22.5	177.83	20	0.0336	0.518	0.036

Note: For the above tune up power were declared by the manufacturer.

GSM850: Maximum Tune-up output power with 1 slot is 33dBm, 2 slot is 31.50 dBm, 3 slot is 30.50 dBm, 4 slot is 30 dBm so the max tune-up time based Ave. power compared to slot Ave. power is 4slot 27dBm

PCS1900: Maximum Tune-up output power with 1 slot is 28.50 dBm, 2 slot is 28.0 dBm, 3 slot is 27.5 dBm, 4 slot is 27.0 dBm so the max tune-up time based Ave. power compared to slot Ave. power is 24dBm

Number of Time slot	1	2	3	4
Duty Cycle	1:8	1:4	1:2.66	1:2
Time based Ave. power compared to slotted Ave. power	-9 dB	-6 dB	-4.26 dB	-3 dB

BLE and WWAN can transmit simultaneously, as below:

$$\sum_i \frac{S_i}{S_{Limit,i}} = 0.0022 + 0.0769 = 0.0791 < 1.0$$

Result: The device meet FCC MPE at 20 cm distance.

EUT PHOTOGRAPHS

Please refer to the attachment EXHIBIT A - EUT EXTERNAL PHOTOGRAPHS and EXHIBIT B - EUT INTERNAL PHOTOGRAPHS.

Declarations

1. The laboratory is not responsible for the authenticity of any information provided by the applicant. Information from the applicant that may affect test results is marked with “★”.
2. The test data was only valid for the test sample(s).
3. This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.
4. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.
5. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor $k=2$ with the 95.45% confidence interval.

******* END OF REPORT *******