RF Exposure Evaluation Declaration

Report No.: S20241022815703
Issue Date: 11-29-2024

Applicant:	Bolt Technology OÜ
Address:	Vana – Lõuna 15, 10134 Tallinn, Estonia
FCC ID:	2BHTW-BOLT-IOTD-2
Application Type:	Certification
Product:	IoT module
Model No.:	IOTD-2
Trade Mark:	Bolt
FCC Rule Part(s):	CFR 47, FCC Part 2.1091 Radio frequency radiation exposure evaluation: mobile devices.
Item Receipt date:	Oct 22, 2024
Test Date:	Oct 23 ~ Nov 28, 2024

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Approved By: Line Chen (Line Chen) Engineer Manager

The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in KDB 558074 D01. Test results reported herein relate only to the item(s) tested.

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The test report must not be used by the client to claim product certifications, approval, or endorsement by NVLAP, NIST or any agency of U.S. Government.

Revision History

Report No.	Version	Description	Issue Date
S20241022815703	Rev. 01	/	11-29-2024

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1. Product Information

1.1. Equipment Description

Product Name:	IoT module
Model Name:	IOTD-2
Trade Mark:	Bolt
Input Voltage Range:	DC24V 0.5A

Note:

This information is provided by the Customer and its authenticity is the responsibility of the Customer.

1.2. Product Specification Subjective to this Report

Frequency Range:	BLE_1M:2402~2480MHz BLE_2M: 2402~2480MHz 802.11b/g/n-HT20: 2412 ~ 2462MHz 802.11n-HT40: 2422 ~ 2452MHz LTE Band2: TX 1850~1910MHz, RX 1930~1990MHz LTE Band4: TX 1710~1755MHz, RX 2110~2155MHz LTE Band5: TX 824~849MHz, RX 869~894MHz LTE Band12: TX 699~716MHz, RX 729~746MHz LTE Band13: TX 777~787MHz, RX 746~756MHz LTE Band66: TX 1710~1780MHz, RX 2110~2200MHz
Modulation type:	BLE: GFSK 802.11b: DSSS 802.11b/g/n-HT20/n-HT40: OFDM LTE: QPSK,16QAM
Antenna Type:	BLE: PCB Antenna 802.11b/g/n-HT20/n-HT40: PCB Antenna LTE: PIFA Antenna
Antenna Gain:	BLE:0.04dBi 802.11b/g/n-HT20/n-HT40:0.04dBi LTE: 1.4dBi

Note:

The maximum Antenna Gain was declared by the manufacturer.

2. RF Exposure Evaluation

2.1. 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				
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/ Uncontrolled Exposures				
300-1500	--	--	f/1500	6
1500-100,000	--	--	1	30

f= Frequency in MHz

Calculation Formula: $Pd = (Pout*G)/(4*pi*r^2)$

Where

Pd = power density in mW/cm^2

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

r = distance between observation point and center of the radiator in cm

Pd is the limit of MPE, $1mW/cm^2$. If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

For simultaneous transmission exposure cases, calculation formula is:

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

2.2. Calculation Method

Product	IoT module
Test Item	RF Exposure Evaluation

Mode	Frequency (MHz)	Maximum Conducted Output Power (dBm)	Antenna Gain (dBi)	PG		MPE (mW/cm^2)	MPE Limits (mW/cm^2)	MPE Ratio
				(dBm)	(mW)			
WLAN	2462	12.59	0.04	12.63	18.32	0.0036	1.00	0.0036
BLE	2480	6.79	0.04	6.83	4.82	0.0010	1.00	0.0010
LTE Band2	1850.7	25.00	1.40	26.40	436.52	0.0868	1.00	0.0868
LTE Band4	1710.7	25.00	1.40	26.40	436.52	0.0868	1.00	0.0868
LTE Band5	824.7	25.00	1.40	26.40	436.52	0.0868	0.5498	0.1579
LTE Band12	699.7	25.00	1.40	26.40	436.52	0.0868	0.4665	0.1861
LTE Band13	779.5	25.00	1.40	26.40	436.52	0.0868	0.5197	0.1670
LTE Band66	1710.7	25.00	1.40	26.40	436.52	0.0868	1.00	0.0868

Remark: 1. MPE use distance is 20cm from manufacturer declaration of user manual.

Remark: 2. Use the maximum gain of all bands when evaluating.

Remark: 3. For simultaneous transmission is WLAN and LTE Band12 (worst case).

$$\sum_{k=1}^{c} \frac{Evaluated_k}{Exposure\ \ Limit_k} = 0.0036+0.1861=0.1897<1.$$

CONCULISON:

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure and SAR Exclusion Threshold per KDB 447498 v06.

The End