



RF Exposure Evaluation Declaration

FCC ID: 2APPT-2821
Applicant: Airthings ASA
Product: Hub Cellular
Model No.: 2820
Brand Name: Airthings
FCC Classification: Digital Transmission System (DTS)
FCC Rule Part(s): FCC Part 2.1091
Received Date: 2023-03-09
Result: Complies

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.
The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

Revision History

Report No.	Version	Description	Issue Date	Note
2303RSU022-U4	V01	Initial Report	2023-06-15	Valid

CONTENTS

Description	Page
1. General Information	4
1.1. Applicant.....	4
1.2. Manufacturer	4
1.3. Testing Facility.....	4
1.4. Product Information	5
1.5. Antenna Information	5
1.6. Device Classification	6
1.7. Applied Standards	6
2. RF Exposure Evaluation.....	7
2.1. Test Limits	7
2.2. MPE Exemptions.....	8
2.3. Calculation Result	11

1.4. Product Information

Product	Hub Cellular
Model No.	2820
SmartLink Specification	905.6 ~ 926 MHz
GSM	850, 1900
LTE Cat M1	Band 2, 4, 5, 12, 13, 26
Antenna Information	Refer to 1.5.
Operating Temp.	0 ~ 45°C
Integrated Modular	
FCC ID	XMR201707BG96
IC	10224A-201709BG96
Model	BG96
Company Name	Quectel Wireless Solution Co., Ltd
Accessory	
Adapter	Model No.: MP12-050160-AX Input: 100V-240V~50/60Hz, 0.4A Max Output: 5.0V=1.6A
Note: 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 Information

Radio Specification	Frequency Band (MHz)	Antenna Type	Antenna Gain (dBi)
SmartLink	905.6~926	PCB Antenna	2.77
GSM 850	824~849		2.15
GSM 1900	1850~1910		3.16
LTE Cat M1 Band 2	1850~1910		3.16
LTE Cat M1 Band 4	1710~1755		3.16
LTE Cat M1 Band 5	824~849		2.15
LTE Cat M1 Band 12	699~716		1.74
LTE Cat M1 Band 13	777~787		2.84
LTE Cat M1 Band 26	824~849		2.15

1.6. 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 Mobile Device.

1.7. 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. Calculation Result

Product	Hub Cellular
Test Item	RF Exposure Evaluation

Radio Specification	Frequency Band (MHz)	Conducted Power (dBm)	Tune-up Conducted Power (dBm)	Directional Gain (dBi)	Tune-up ERP (dBm)
SmartLink	905.6 ~926	14.895	15.0	2.77	15.62
GSM 850	824~849	N/A	23.97	2.15	23.97
GSM 1900	1850~1910	N/A	20.97	3.16	21.98
LTE Cat M1 Band 2	1850~1910	N/A	24.00	3.16	25.01
LTE Cat M1 Band 4	1710~1755	N/A	23.00	3.16	24.01
LTE Cat M1 Band 5	824~849	N/A	24.00	2.15	24.00
LTE Cat M1 Band 12	699~716	N/A	24.00	1.74	23.59
LTE Cat M1 Band 13	777~787	N/A	24.00	2.84	24.69
LTE Cat M1 Band 26	824~849	N/A	24.00	2.15	24.00

Note 1: ERP (dBm) = Conducted Power (dBm) + Antenna Gain (dBi) -2.15

Note 2: Tune-up power was declared by manufacturer.

For Single RF source, Option B

Test Mode	d (m)	Max. (Tune-up Conducted Power, Tune-up ERP) (mW)	Exemption Thresholds (mW)	Ratio
SmartLink	0.20	36.475	1847.4	0.020
GSM 850	0.20	249.459	1680.96	0.148
GSM 1900	0.20	157.761	3774	0.0412
LTE Cat M1 Band 2	0.20	316.957	3774	0.084
LTE Cat M1 Band 4	0.20	251.768	3488.4	0.072
LTE Cat M1 Band 5	0.20	251.189	1680.96	0.149
LTE Cat M1 Band 12	0.20	228.560	1425.96	0.160
LTE Cat M1 Band 13	0.20	294.442	1585.08	0.185
LTE Cat M1 Band 26	0.20	251.189	1680.96	0.020

Note: Ratio = Turn-up ERP (mW) / Threshold ERP (mW)

For multiple RF sources

The EUT supports SmartLink + LTE Cat M1 transmissions.

The max ratio of simultaneous transmission = 0.020 + 0.185 (LTE Cat M1 Band 13) = 0.205 < 1

Therefore, the device qualifies for RF exposure test exemption.

_____ The End _____