

REPORT ON EXPOSURE TO ELECTROMAGNETIC FIELDS

No. 2019067STO-305

EQUIPMENT

Equipment: Gateway

Type/Model: Gateway for Tork EasyCube™ LTE-M (802.15.4 version)

Manufacturer: TENA SmartCare Gateway (Bluetooth Low Energy version)
Essity Hygiene and Health AB

Tested by request of: Essity Hygiene and Health AB

SUMMARY

Based on the assessment in this statement, the equipment is determined to **comply** with the following requirements without testing:

EN 50665: 2017
CFR 47 §1.1307, §1.1310
RSS-102 Issue 5

Date of issue: September 21, 2020

Tested by:


Robert Hietala

Approved by:


Björn Utermöhl

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Revision History

Test report number	Date	Description	Changes
2019067STO-305	September 21, 2020	First release	--

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1 CLIENT INFORMATION

This assessment has been done by request of:

Company	Essity Hygiene and Health AB Mölnåls bro 2, Mölnåls SE-405 03 Göteborg Essity Hygiene and Health AB
Name of contact	Magnus Nordin

2 EQUIPMENT

2.1 Identification of the equipment

Equipment:	Gateway
Type/Model:	TENA SmartCare (BLE version) Tork EasyCube (802.15.4 version)
Brand name:	Essity Hygiene and Health AB
Manufacturer:	Essity Hygiene and Health AB
Transmitter frequency range:	GSM850, GSM900, GSM1800, GSM1900, LTE Cat M1, LTE Cat NB1, Bluetooth Low Energy and 802.15.4.
Measured output power to antenna:	+7.0 dBm for 802.15.4 ¹ -2.3 dBm for Bluetooth Low Energy ¹ +33 dBm for GSM (worst case) ² +24 dBm for LTE (worst case) ²
Antenna gain ³ :	+0 dBi for 802.15.4 +0 dBi for Bluetooth Low Energy +5.8 dBi for GSM +3.7 dBi for LTE
User separation distance:	20 cm
Exposure conditions:	<input type="checkbox"/> Controlled environment (occupational) <input checked="" type="checkbox"/> Uncontrolled environment (general population)

¹ Reference for measurement: Intertek test report 1910014STO-002 Ed.1

² Reference: AirPrime WP77XX Product Specification version 5

³ Declared by the client

3 TEST SPECIFICATIONS

3.1 Standards

EN 50665: 2017 Product standard for assessment of the compliance of low power electronic and electrical equipment with the basic restrictions related to human exposure to electromagnetic fields (10 MHz to 300 GHz)

EN 62311: 2008 Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz - 300 GHz)
 Council Recommendation 1999/519/EC of 12 July 1999, on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz)

CFR 47: Code of Federal Regulations Title 47: Telecommunications §1.1307, §1.1310
 KDB447498 D01 v06

RSS-102: Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)

4 SUMMARY

The evaluation has been carried out at the Intertek Semko AB premises in Kista, Sweden. The results in this report apply only to sample tested:

Test	Result
RF Exposure, single transmitter	PASS
RF Exposure, multiple simultaneous transmitters	PASS

5 RF EXPOSURE, SINGLE TRANSMITTER

Result:	PASS
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5.1 Limits

References:

EN 50665: 2017 Product standard for assessment of the compliance of low power electronic and electrical equipment with the basic restrictions related to human exposure to electromagnetic fields (10 MHz to 300 GHz)

EN 62311: 2008 Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz - 300 GHz)

COUNCIL RECOMMENDATION of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz) 1999/519/EC: Annex 3 reference levels

**Reference levels for electric, magnetic and electromagnetic fields
(0 Hz to 300 GHz, unperturbed rms values)**

Frequency range	E-field strength (V/m)	H-field strength (A/m)	B-field (μT)	Equivalent plane wave power density S_{eq} (W/m ²)
0-1 Hz	—	$3,2 \times 10^4$	4×10^4	—
1-8 Hz	10 000	$3,2 \times 10^4/f^2$	$4 \times 10^4/f^2$	—
8-25 Hz	10 000	$4\,000/f$	$5\,000/f$	—
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	0,092	2
400-2 000 MHz	$1,375 f^{1/2}$	$0,0037 f^{1/2}$	$0,0046 f^{1/2}$	$f/200$
2-300 GHz	61	0,16	0,20	10

Reference: CFR 47 §1.1310 TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
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 Exposure				
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

Reference: RSS-102 – Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) Issue 5

Section 2.5.2,

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device’s radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $4.49/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

5.2 Calculations

EIRP: $Power\ to\ antenna\ (dBm) + Antenna\ gain\ (dBi) = EIRP\ dBm$

Conversion dBm to W:

Conducted: $1\ mW * 10^{(Power\frac{dBm}{10})}$

EIRP: $1\ mW * 10^{(EIRP\frac{dBm}{10})}$

MPE calculation

A worst-case calculation for power density:

$$S = \frac{dc \times EIRP}{4 \times \pi \times r^2}$$

dc = duty cycle = 1 for all except for GSM where dc = 1/8.

S = W / m²

r = 20 cm

5.3 Results, GSM

Standard	Reference for limit	GSM ¹	Unit	Limit	Result
EN 50665:2017	1999/519/EC	1.9	W/m ²	4.1 ²	PASS
§1.1310	§1.1310	1.9	W/m ²	5.5 ²	PASS
RSS-102	RSS-102	0.9	W	1.3 ²	PASS

¹Based on GSM 850/900 worst-case +33 dBm conducted and 5.8 dBi antenna gain

²Based on uplink frequency of 824.2 MHz

5.4 Results, LTE

Standard	Reference for limit	LTE ¹	Unit	Limit	Result
EN 50665:2017	1999/519/EC	1.2	W/m ²	3.5 ²	PASS
§1.1310	§1.1310	1.2	W/m ²	4.7 ²	PASS
RSS-102	RSS-102	0.6	W	1.15 ²	PASS

¹Based on LTE worst-case +24 dBm conducted and 3.7 dBi antenna gain

²Based on uplink frequency of 699 MHz (band 12)

5.5 Results, Bluetooth Low Energy

Standard	Reference for limit	BLE	Unit	Limit	Result
EN 50665:2017	1999/519/EC	0.001	W/m ²	10	PASS
§1.1310	§1.1310	0.001	W/m ²	10	PASS
RSS-102	RSS-102	0.0006	W	2.7 ¹	PASS

¹Based on frequency 2402 MHz

5.6 Results, 802.15.4

Standard	Reference for limit	802.15.4	Unit	Limit	Result
EN 50665:2017	1999/519/EC	0.01	W/m ²	10	PASS
§1.1310	§1.1310	0.01	W/m ²	10	PASS
RSS-102	RSS-102	0.005	W	2.7 ¹	PASS

¹Based on frequency 2405 MHz

6 RF EXPOSURE, MULTIPLE TRANSMITTERS

Result:	PASS
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6.1 Simultaneous transmission

Under simultaneous transmission conditions the sum of ratio of each transmitter to the corresponding limit shall be less than unity.

$$\sum_{i=1}^n \frac{S_i}{MPE_i} < 1$$

6.2 Results

Bluetooth Low Energy can transmit simultaneously as either GSM or LTE.

802.15.4 can transmit simultaneously as either GSM or LTE.

Bluetooth Low Energy and 802.15.4 cannot transmit simultaneously.

EN 50665

BLE + GSM = 0.46

BLE + LTE = 0.34

802.15.4 + GSM = 0.46

802.15.4 + LTE = 0.34

§1.1310

BLE + GSM = 0.35

BLE + LTE = 0.26

802.15.4 + GSM = 0.35

802.15.4 + LTE = 0.26

RSS-102

BLE + GSM = 0.69

BLE + LTE = 0.52

802.15.4 + GSM = 0.69

802.15.4 + LTE = 0.52