

REPORT ON EXPOSURE TO ELECTROMAGNETIC FIELDS

No. 1812019STO-006, Ed. 2

EQUIPMENT

Equipment: IC card reader
Type/Model: LV-700CW/UC
Additional type/models*: LV-700W/UC
Manufacturer: Lecip Arcontia AB
Tested by request of: Lecip Arcontia AB

*See opinions and interpretations clause 2.5

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: 2019-10-29

Tested by:



Robert Hietala

Approved by:



Matti Virkki

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Revision History

Edition	Date	Description	Changes
1	2019-07-24	First release	--
2	2019-10-29	Second release	Updated additional type/model section; removed certain models.

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1 CLIENT INFORMATION

This assessment has been done by request of:

Company	Lecip Arcontia AB Krokslätts fabriker 30 S-431 37 Mölndal Sweden
Name of contact	Muhammad Saqib Phone +46 31499930

2 EQUIPMENT

2.1 Identification of the equipment and RFID power

Equipment:	IC card reader
Type/Model:	LV-700CW/UC
Additional model:	LV-700W/UC
Brand name:	Lecip Arcontia AB
Manufacturer:	Lecip Arcontia AB
Transmitter frequency range:	13,56 MHz
Measured output power to antenna*:	5.9 dBuA/m at 10 m
Declared output power to antenna:	+30 dBm
Antenna gain:	Not defined, magnetic loop antenna
Measured duty cycle*:	100 %
User separation distance:	20 cm
Exposure conditions:	<input type="checkbox"/> Controlled environment (occupational) <input checked="" type="checkbox"/> Uncontrolled environment (general population)

*Reference for measurement: Test report 1812019STO-002, Ed. 1

2.2 Opinions and interpretations

The following type is also included as an additional type in this test report:

LV-700W/UC

The difference as compared to the tested type is (according to the manufacturer):

Part Nr.	Model Name	Description
8-0027	LV-700CW/UC	WiFi/Bluetooth, 3G/4G Modem (US)- with camera (tested type)
8-0014	LV-700W/UC	3G/4GModem(US)/WiFi/Bluetooth/No camera

The difference is considered not to imply different radio-characteristics when compared to the tested type. Therefore, this type is not tested, but considered to have the same radio-characteristics as the tested type.

2.3 Power levels for all the other bands in EUT

The power levels for the GSM/GPRS and LTE module:

	Ant. gain
GSM/GPRS 900: 33.5 dBm	2,6 dBi
GSM/GPRS 1800: 30.5 dBm	2,6 dBi
EDGE 900 : 28 dBm	2,6 dBi
EDGE 1800: 27 dBm	4,4 dBi
LTE FDD 1 /3 / 7 /8 / 20: 24 dBm	4,4 dBi

The power level for BLE:

BLE 7,5 dBm	0 dBi
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The power level for WLAN:

WLAN 17,5 dBm	0 dBi
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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)

3.2 Additions, deviations and exclusions from standards

No additions, deviations or exclusions have been made from standards.

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	NA
RF Exposure, multiple simultaneous transmitters	Pass

5 RF EXPOSURE

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 for BLE

EIRP: $Power\ to\ antenna\ (dBm) + Antenna\ gain\ (dBi) = EIRP\ dBm$
 Declared EIRP = 7,5 dBm
 Declared antenna gain = 0 dBi
 Measured EIRP = --
 Declared duty cycle = 100 %

Conversion dBm to W:

Conducted: $1\ mW * 10^{(Power\frac{dBm}{10})} = 5,6\ mW$

EIRP: $1\ mW * 10^{(EIRP\frac{dBm}{10})} = 5,6\ mW$

Time averaged maximum power:

Conducted: $EIRP\ mW * Duty\ cycle = 5,6\ mW$

EIRP: $EIRP\ mW * Duty\ cycle = 5,6\ mW$

MPE calculation

A worst case calculation for power density:

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

dc = 1

S = W / m²

r = 20 cm

S = 0,011 W / m²

5.3 Results

Standard	Reference for limit	Value	Unit	Limit	Result
EN 50665: 2017	1999/519/EC	0,011	W/m ²	10	PASS
§1.1310	§1.1310	0,018	-	7,5	PASS
RSS-102	RSS-102	0,0056	W	2,7	PASS

5.4 Calculations for WLAN

EIRP: $Power\ to\ antenna\ (dBm) + Antenna\ gain\ (dBi) = EIRP\ dBm$
 Declared EIRP = 17,5 dBm
 Declared antenna gain = 0 dBi
 Measured EIRP = -
 Declared duty cycle = 100 %

Conversion dBm to W:

Conducted: $1\ mW * 10^{(Power\frac{dBm}{10})} = 56,2\ mW$

EIRP: $1\ mW * 10^{(EIRP\frac{dBm}{10})} = 56,2\ mW$

Time averaged maximum power:

Conducted: $EIRP\ mW * Duty\ cycle = 56,2\ mW$

EIRP: $EIRP\ mW * Duty\ cycle = 56,2\ mW$

MPE calculation

A worst case calculation for power density:

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

dc = 1

S = W / m²

r = 20 cm

S = 0,11 W / m²

5.5 Results

Standard	Reference for limit	Value	Unit	Limit	Result
EN 50665: 2017	1999/519/EC	0,11	W/m ²	10	PASS
§1.1310	§1.1310	0,018	-	7,5	PASS
RSS-102	RSS-102	0,056	W	2,7	PASS

5.6 Calculations for GSM 900

EIRP: $Power\ to\ antenna\ (dBm) + Antenna\ gain\ (dBi) = EIRP\ dBm$
 Declared EIRP = 36,1 dBm
 Declared antenna gain = 2,6 dBi
 Measured EIRP = -
 Declared duty cycle = 12,5 %

Conversion dBm to W:

EIRP: $1\ mW * 10^{(EIRP \frac{dBm}{10})} = 4\ 1,\ W$

Time averaged maximum power:

EIRP: $EIRP\ W * Duty\ cycle = 0,51\ W$

MPE calculation

A worst case calculation for power density:

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

dc = 1
 S = W / m²
 r = 20 cm

S = 1,0 W / m²

5.7 Results

Standard	Reference for limit	Value	Unit	Limit	Result
EN 50665: 2017	1999/519/EC	1,0	W/m ²	10	PASS
§1.1310	§1.1310	2,6	-	7,5	PASS
RSS-102	RSS-102	0,51	W	1,4	PASS

5.8 Calculations for GSM 1800

EIRP: $Power\ to\ antenna\ (dBm) + Antenna\ gain\ (dBi) = EIRP\ dBm$
 Declared EIRP = 33,1 dBm
 Declared antenna gain = 2,6 dBi
 Measured EIRP = -
 Declared duty cycle = 12.5 %

Conversion dBm to W:

EIRP: $1\ mW * 10^{(EIRP \frac{dBm}{10})} = 2,0\ W$

Time averaged maximum power:

EIRP: $EIRP\ W * Duty\ cycle = 0.26\ W$

MPE calculation

A worst case calculation for power density:

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

dc = 0.125

S = W / m²

r = 20 cm

S = 0.51 W / m²

5.9 Results

Standard	Reference for limit	Value	Unit	Limit	Result
EN 50665: 2017	1999/519/EC	0.51	W/m ²	10	PASS
§1.1310	§1.1310	2.9	- ²	7,5	PASS
RSS-102	RSS-102	0.26	W	0.48	PASS

5.10 Calculations for EDGE 900

EIRP: $Power\ to\ antenna\ (dBm) + Antenna\ gain\ (dBi) = EIRP\ dBm$
 Declared EIRP = 30.6 dBm
 Declared antenna gain = 2.6 dBi
 Measured EIRP = -
 Declared duty cycle = 12.5 %

Conversion dBm to W:

EIRP: $1\ mW * 10^{(EIRP \frac{dBm}{10})} = 1.15\ W$

Time averaged maximum power:

EIRP: $EIRP\ W * Duty\ cycle = 0.14\ W$

MPE calculation

A worst case calculation for power density:

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

dc = 0.125
 S = W / m²
 r = 20 cm

S = 0.29 W / m²

5.11 Results

Standard	Reference for limit	Value	Unit	Limit	Result
EN 50665: 2017	1999/519/EC	0.29	W/m ²	10	PASS
§1.1310	§1.1310	0,73	- ²	7,5	PASS
RSS-102	RSS-102	0.14	W	1.43	PASS

5.12 Calculations for EDGE 1800

EIRP: $Power\ to\ antenna\ (dBm) + Antenna\ gain\ (dBi) = EIRP\ dBm$
 Declared EIRP = 31.4 dBm
 Declared antenna gain = 4.4 dBi
 Measured EIRP = -
 Declared duty cycle = 12.5 %

Conversion dBm to W:

EIRP: $1\ mW * 10^{(EIRP \frac{dBm}{10})} = 1.38\ W$

Time averaged maximum power:

EIRP: $EIRP\ W * Duty\ cycle = 0.17\ W$

MPE calculation

A worst case calculation for power density:

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

dc = 0.125

S = W / m²

r = 20 cm

S = 0.34 W / m²

5.13 Results

Standard	Reference for limit	Value	Unit	Limit	Result
EN 50665: 2017	1999/519/EC	0.34	W/m ²	10	PASS
§1.1310	§1.1310	1.99	- ²	7,5	PASS
RSS-102	RSS-102	0.17	W	0.47	PASS

5.14 EN 50665 calculations for all frequencies

Summary table for EN50665 calculations

Band	Power dBm	Ant. Gain dB	EIRP dBm	EIRP W	EIRP xDC	S W/m ²	Limit	Result single transmitter	
GSM900	33,5	2,6	36,1	4,07	0,51	1,01	4,8	Pass	
GSM1800	30,5	2,6	33,1	2,04	0,26	0,51	5,9	Pass	
EDGE900	28	2,6	30,6	1,15	0,14	0,29	4,8	Pass	
EDGE1800	27	4,4	31,4	1,38	0,17	0,34	5,9	Pass	
LTE	24	4,4	28,4	0,69	0,09	0,17	10,0	Pass	
BLE	7,5	0	7,5	0,01	0,01	0,01	10,0	Pass	
WLAN	17,5	0	17,5	0,06	0,06	0,11	10,0	Pass	
RFID*			5,9				97,3	Pass	

*RFID unit dBuA/m and not dBm

DC is duty cycle

Summary table for EN50665 calculations, simultaneous transmission

Band	S/Limit	Sum of S/Limit ratios	Limit	Result simultaneous transmission
GSM900	0,21	0,28	<1	Pass
GSM1800	0,09	0,16	<1	Pass
EDGE900	0,06	0,13	<1	Pass
EDGE1800	0,06	0,13	<1	Pass
LTE	0,02	0,09	<1	Pass
BLE	0,00	-	-	-
WLAN	0,01	-	-	-
RFID*	0,06	-	-	-

Note: BLE, WLAN and RFID transmit continuous with either one of GSM 900, GSM 1800, EDGE 900 or EDGE 1800.

5.15 1.1310 calculations for all frequencies

Summary table for 1.1310 calculations

Band	Power dBm	Ant. Gain dB	EIRP dBm	EIRP W	EIRP xDC	Value	Limit	Result single transmitter
GSM900	33,5	2,6	36,1	4,07	0,51	2,60	7,5	Pass
GSM1800	30,5	2,6	33,1	2,04	0,26	2,94	7,5	Pass
EDGE900	28	2,6	30,6	1,15	0,14	0,73	7,5	Pass
EDGE1800	27	4,4	31,4	1,38	0,17	1,99	7,5	Pass
LTE	24	4,4	28,4	0,69	0,09	0,94	7,5	Pass
BLE	7,5	0	7,5	0,01	0,01	0,02	7,5	Pass
WLAN	17,5	0	17,5	0,06	0,06	0,18	7,5	Pass
RFID*			5,9				-	-

*RFID unit dBuA/m and not dBm

DC is duty cycle

Summary table for 1.1310 calculations, simultaneous transmission

Band	Value/Limit	Sum of Value/Limit ratios	Limit	Result simultaneous transmission
GSM900	0,35	0,43	<1	Pass
GSM1800	0,39	0,48	<1	Pass
EDGE900	0,10	0,18	<1	Pass
EDGE1800	0,27	0,35	<1	Pass
LTE	0,13	0,21	<1	Pass
BLE	0,00	-	-	-
WLAN	0,02	-	-	-
RFID*	0,06	-	-	-

Note: BLE, WLAN and RFID transmit continuous with either one of GSM 900, GSM 1800, EDGE 900 or EDGE 1800.

5.16 RSS-102 calculations for all frequencies

Summary table for RSS-102 calculations

Band	Power dBm	Ant. Gain dB	EIRP dBm	EIRP W	EIRP xDC	Limit	Result single transmitter
GSM900	33,5	2,6	36,1	4,07	0,51	1,43	Pass
GSM1800	30,5	2,6	33,1	2,04	0,26	0,47	Pass
EDGE900	28	2,6	30,6	1,15	0,14	1,43	Pass
EDGE1800	27	4,4	31,4	1,38	0,17	0,47	Pass
LTE	24	4,4	28,4	0,69	0,09	0,51	Pass
BLE	7,5	0	7,5	0,01	0,01	2,74	Pass
WLAN	17,5	0	17,5	0,06	0,06	2,74	Pass
RFID*			5,9			104,00	-

*RFID unit dBuA/m and not dBm
 DC is duty cycle

Summary table for RSS-102 calculations, simultaneous transmission

Band	Value/Limit	Sum of Value/Limit ratios	Limit	Result simultaneous transmission
GSM900	0,36	0,44	<1	Pass
GSM1800	0,54	0,62	<1	Pass
EDGE900	0,10	0,18	<1	Pass
EDGE1800	0,37	0,45	<1	Pass
LTE	0,17	0,25	<1	Pass
BLE	0,00	-	-	-
WLAN	0,02	-	-	-
RFID*	0,06	-	-	-

Note: BLE, WLAN and RFID transmit continuous with either one of GSM 900, GSM 1800, EDGE 900 or EDGE 1800.