

Assessment report No:

NIE: 55367RAN.003

Assessment report RF EXPOSURE REPORT ACCORDING TO FCC 47 CFR Part 2.1091 ISED RSS -102 Issue 5:2015

Identification of item tested.....:	LTE Cellular Alarm Communicator
Trademark	DSC
Model and /or type reference	LE4000
Other identification of the product	IMEI: 356961070321222
Final HW version	UA724 Rev. 01
Final SW version	Ver. 5.0
Features	Cellular Alarm Communicator module used in conjunction with Fire and Security Alarm System to monitor and send alarm events from protected premises to a supervising station using the cellular network
Manufacturer.....:	Company Name: DIGITAL SECURITY CONTROLS, A DIV. OF TYCO SAFTEY PRODUCTS CANAD LTD. Postal Address: 3301 Langstaff Rd. , Concord, ON L4K4L2 Canada
Test method requested, standard.....:	FCC 47 CFR Part 2.1091 Radiofrequency radiation exposure evaluation: mobile devices. ISED RSS-102 Issue 5 (2015-03) – Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Miguel Lacave Antennas Lab Manager
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Identification of the client

Company name: DIGITAL SECURITY CONTROLS

Postal Address: 3301 Langstaff Rd., Concord, ON L4K4L2 Canada

General description of the device under evaluation

The device under evaluation consists of a Cellular Alarm Communicator module used in conjunction with Fire and Security Alarm System to monitor and send alarm events from protected premises to a supervising station using the cellular network.

Once installed the minimum separation distance between the transmitting antenna and any nearby person will be greater than 20 cm. In order to perform the assessment a conservative separation distance of 20 cm has been used.

According to the manufacturer, the maximum output power values for each transmitting technology are:

Band (MHz)	Technology	Band	Maximum output power (dBm)
700	LTE	12	24.5
750	LTE	13	24.5
850	WCDMA	V	24.0
850	LTE	5	24.5
1700	LTE	4	24.5
1900	WCDMA	II	24.0
1900	LTE	2	24.5

Table 1: Maximum declared output power values.

As stated in DEKRA Testing and Certification Co. Reports No.: 1750379R-HPUSP50V00 and 1750379R-HPUSP50V00-A, the maximum antenna gain, and therefore maximum E.I.R.P values for each supported transmitting band will be:

Band (MHz)	Technology	Band	Maximum Antenna gain (dBi)	Maximum output power (dBm)	Maximum E.I.R.P (dBm)
700	LTE	12	+4.40	24.5	28.90
750	LTE	13	+4.40	24.5	28.90
850	WCDMA	V	+3.90	24.0	27.90
850	LTE	5	+3.90	24.5	28.40
1700	LTE	4	+2.98	24.5	27.48
1900	WCDMA	II	+2.98	24.0	26.98
1900	LTE	2	+2.98	24.5	27.48

Table 2: Maximum antenna gain and maximum E.I.R.P values

Assessment summary

Radiofrequency radiation exposure limits			
FCC 47 CFR § 2.1091 & ISED RSS-102 Issue 5 (2015-03)			
Band (MHz)	Technology	Band	VERDICT (Pass/Fail)
700	LTE	12	Pass
750	LTE	13	Pass
850	WCDMA/HSPA	V	Pass
850	LTE	5	Pass
1700	LTE	4	Pass
1900	WCDMA/HSPA	II	Pass
1900	LTE	2	Pass
2500	LTE	7	Pass

Appendix A – FCC RF Exposure

FCC RF Exposure evaluation for mobile devices

Devices operating in standalone mobile device exposure conditions may contain a single transmitter or multiple transmitters that do not transmit simultaneously. A minimum test separation distance ≥ 20 cm is required between the antenna and radiating structures of the device and nearby persons to apply mobile device exposure limits. The distance must be at least 20 cm and fully supported by the operating and installation configurations of the transmitter and its antenna(s), according to the source-based time-averaged maximum power requirements of § 2.1091(d)(2). In cases where cable losses or other attenuations are applied to determine compliance, the most conservative operating configurations and exposure conditions must be evaluated. The minimum test separation distance required for a device to comply with mobile device exposure conditions must be clearly identified in the installation and operating instructions, for all installation and exposure conditions, to enable users and installers to comply with RF exposure requirements. For mobile devices that have the potential to operate in portable device exposure conditions, similar to the configurations described in § 2.1091(d)(4), a KDB inquiry is required to determine the SAR test requirements for demonstrating compliance.

When a device qualifies for the categorical exclusion provision of § 2.1091(c), the minimum test separation distance may be estimated, when applicable, by simple calculations according to plane-wave equivalent conditions, to ensure the transmitter and its antenna(s) can operate in manners that meet or exceed the estimated distance. The source-based time-averaged maximum radiated power, according to the maximum antenna gain, must be applied to calculate the field strength and power density required to establish the minimum test separation distance. When the estimated test separation distance becomes overly conservative and does not support compliance, MPE measurement or computational modeling may be used to determine the required minimum separation distance.

According to §1.1310 Radiofrequency radiation exposure limits, paragraph (e), the limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields are:

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

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

FCC MPE Evaluation Results

Each supported transmission technology will be evaluated to determine if it is in compliance with limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields.

In order to perform the assessment, the following equations have been used for the calculations:

$$\text{Power density: } S[mW/cm^2] = \frac{P_{\max}[mW]}{4\pi R[cm]^2}$$

$$\text{Minimum compliance distance: } R_{\min}[m] = \sqrt{\frac{P_{\max}[mW]}{4\pi S[mW/cm^2]}}$$

$$\text{Maximum gain to meet the MPE limit: } G_{\max}[dBi] = (10 * \log[S[mW/cm^2] * 4\pi R[m]^2] - P_{\max}[dBm])$$

S = power density

$P_{\max}$ = power input to the antenna

R = distance to the center of radiation of the antenna (evaluation distance)

$R_{\min}$ = distance to the center of radiation of the antenna

$G_{\max}$ = power gain of the antenna in the direction of interest relative to an isotropic radiator

Assessment 1 – LTE Band 12

Max output power (dBm):	24.5
Antenna Gain (dBi):	4.4
Minimum use distance (cm):	20.0
Worst Case Frequency (MHz):	699.97
Maximum EIRP (dBm):	28.90
Maximum EIRP (mW):	776.25
General public - Power density limit (mW/cm ²):	0.46

Power density at minimum use distance:

Power density (mW/cm ²):	0.15
Verdict:	PASS

The power density level for this transmission mode is below general population exposure power density limit.

Minimum compliance distance for this technology:

Minimum distance for general public (cm):	11.51
Verdict:	PASS

The minimum use distance is greater than general population exposure minimum compliance distance.

Maximum gain to meet the §1.1310 Radiofrequency radiation exposure limits:

Maximum antenna gain to meet reference level (dBi):	9.2
Power density using max antenna gain (mW/cm ²):	0.466

The power density level using the maximum antenna gain for this transmission mode will be below power density reference level.

Assessment 2 – LTE Band 13

Max output power (dBm):	24.50
Antenna Gain (dBi):	4.4
Minimum use distance (cm):	20
Worst Case Frequency (MHz):	777
Maximum EIRP (dBm):	28.90
Maximum EIRP (mW):	776.25
General public - Power density limit (mW/cm ²):	0.518

Power density at minimum use distance:

Power density (mW/cm ²):	0.15
Verdict:	PASS

The power density level for this transmission mode is below general population exposure power density limit.

Minimum compliance distance for this technology:

Minimum distance for general public (cm):	10.92
Verdict:	PASS

The minimum use distance is greater than general population exposure minimum compliance distance.

Maximum gain to meet the §1.1310 Radiofrequency radiation exposure limits:

Maximum antenna gain to meet reference level (dBi):	9.6
Power density using max antenna gain (mW/cm ²):	0.511

The power density level using the maximum antenna gain for this transmission mode will be below power density reference level.

Assessment 3 – WCDMA Band V

Max output power (dBm):	24.00
Antenna Gain (dBi):	3.9
Minimum use distance (cm):	20
Worst Case Frequency (MHz):	826.4
Maximum EIRP (dBm):	27.90
Maximum EIRP (mW):	616.60
General public - Power density limit (mW/cm ²):	0.55

Power density at minimum use distance:

Power density (mW/cm ²):	0.12
Verdict:	PASS

The power density level for this transmission mode is below general population exposure power density limit.

Minimum compliance distance for this technology:

Minimum distance for general public (cm):	9.44
Verdict:	PASS

The minimum use distance is greater than general population exposure minimum compliance distance.

Maximum gain to meet the §1.1310 Radiofrequency radiation exposure limits:

Maximum antenna gain to meet reference level (dBi):	10.4
Power density using max antenna gain (mW/cm ²):	0.548

The power density level using the maximum antenna gain for this transmission mode will be below power density reference level.

Assessment 4 – LTE Band 5

Max output power (dBm):	24.50
Antenna Gain (dBi):	3.9
Minimum use distance (cm):	20
Worst Case Frequency (MHz):	824
Maximum EIRP (dBm):	28.40
Maximum EIRP (mW):	691,83
General public - Power density limit (mW/cm ²):	0.549

Power density at minimum use distance:

Power density (mW/cm ²):	0.14
Verdict:	PASS

The power density level for this transmission mode is below general population exposure power density limit.

Minimum compliance distance for this technology:

Minimum distance for general public (cm):	10.01
Verdict:	PASS

The minimum use distance is greater than general population exposure minimum compliance distance.

Maximum gain to meet the §1.1310 Radiofrequency radiation exposure limits:

Maximum antenna gain to meet reference level (dBi):	9.9
Power density using max antenna gain (mW/cm ²):	0.548

The power density level using the maximum antenna gain for this transmission mode will be below power density reference level.

Assessment 5 – LTE Band 4

Max output power (dBm):	24.50
Antenna Gain (dBi):	2.98
Minimum use distance (cm):	20
Worst Case Frequency (MHz):	1710
Maximum EIRP (dBm):	27.48
Maximum EIRP (mW):	559.76
General public - Power density limit (mW/cm ²):	1.0

Power density at minimum use distance:

Power density (mW/cm ²):	0.11
Verdict:	PASS

The power density level for this transmission mode is below general population exposure power density limit.

Minimum compliance distance for this technology:

Minimum distance for general public (cm):	6.67
Verdict:	PASS

The minimum use distance is greater than general population exposure minimum compliance distance.

Maximum gain to meet the §1.1310 Radiofrequency radiation exposure limits:

Maximum antenna gain to meet reference level (dBi):	12.5
Power density using max antenna gain (mW/cm ²):	0.997

The power density level using the maximum antenna gain for this transmission mode will be below power density reference level.

Assessment 6 – WCDMA Band II

Max output power (dBm):	24.00
Antenna Gain (dBi):	2.98
Minimum use distance (cm):	20
Worst Case Frequency (MHz):	1850
Maximum EIRP (dBm):	26.98
Maximum EIRP (mW):	498.88
General public - Power density limit (mW/cm ²):	1.0

Power density at minimum use distance:

Power density (mW/cm ²):	0.10
Verdict:	PASS

The power density level for this transmission mode is below general population exposure power density limit.

Minimum compliance distance for this technology:

Minimum distance for general public (cm):	6.30
Verdict:	PASS

The minimum use distance is greater than general population exposure minimum compliance distance.

Maximum gain to meet the §1.1310 Radiofrequency radiation exposure limits:

Maximum antenna gain to meet reference level (dBi):	13.0
Power density using max antenna gain (mW/cm ²):	0.997

The power density level using the maximum antenna gain for this transmission mode will be below power density reference level.

Assessment 7 – LTE Band 2

Max output power (dBm):	24.50
Antenna Gain (dBi):	2,98
Minimum use distance (cm):	20
Worst Case Frequency (MHz):	1850
Maximum EIRP (dBm):	27.48
Maximum EIRP (mW):	559.76
General public - Power density limit (mW/cm ²):	1.0

Power density at minimum use distance:

Power density (mW/cm ²):	0.11
Verdict:	PASS

The power density level for this transmission mode is below general population exposure power density limit.

Minimum compliance distance for this technology:

Minimum distance for general public (cm):	6.67
Verdict:	PASS

The minimum use distance is greater than general population exposure minimum compliance distance.

Maximum gain to meet the §1.1310 Radiofrequency radiation exposure limits:

Maximum antenna gain to meet reference level (dBi):	12.5
Power density using max antenna gain (mW/cm ²):	0.997

The power density level using the maximum antenna gain for this transmission mode will be below power density reference level.

Appendix B – ISED RF Exposure

ISED RF Exposure evaluation for mobile devices

According to RSS-102 Issue 5, Paragraph “4. Exposure Limits”, Industry of Canada has adopted the RF field strength limits established in Health Canada’s RF exposure guideline, Safety code 6:

**Table 4: RF Field Strength Limits for Devices Used by the General Public
(Uncontrolled Environment)**

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
0.003-10 ⁻²¹	83	90	-	Instantaneous*
0.1-10	-	0.73/ <i>f</i>	-	6**
1.1-10	87/ <i>f</i> ^{0.5}	-	-	6**
10-20	27.46	0.0728	2	6
20-48	58.07/ <i>f</i> ^{0.25}	0.1540/ <i>f</i> ^{0.25}	8.944/ <i>f</i> ^{0.5}	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 <i>f</i> ^{0.3417}	0.008335 <i>f</i> ^{0.3417}	0.02619 <i>f</i> ^{0.6834}	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ <i>f</i> ^{1.2}
150000-300000	0.158 <i>f</i> ^{0.5}	4.21 x 10 ⁻⁴ <i>f</i> ^{0.5}	6.67 x 10 ⁻⁵ <i>f</i>	616000/ <i>f</i> ^{1.2}
Note: <i>f</i> is frequency in MHz. *Based on nerve stimulation (NS). ** Based on specific absorption rate (SAR).				

MPE Evaluation Results

Each supported transmission technology will be evaluated to determine if it is in compliance with RSS102 Issue 5, RF Field Strength Limits for devices used by the General Public.

In order to perform the assessment, the following equations have been used for the calculations:

$$\text{Power density: } S[W / m^2] = \frac{P_{\max}[W]}{4\pi R[m]^2}$$

$$\text{Minimum compliance distance: } R_{\min}[m] = \sqrt{\frac{P_{\max}[W]}{4\pi S[W / m^2]}}$$

$$\text{Maximum gain to meet the RSS -102 limit: } G_{\max}[dBi] = (10 * \log[S[W / m^2] * 4\pi R[m]^2] + 30 - P_{\max}[dBm])$$

S = power density

$P_{\max}$ = power input to the antenna

R = distance to the center of radiation of the antenna (evaluation distance)

$R_{\min}$ = distance to the center of radiation of the antenna

$G_{\max}$ = power gain of the antenna in the direction of interest relative to an isotropic radiator

Assessment 1 – LTE Band 12

Max output power (dBm):	24.50
Antenna Gain (dBi):	4.4
Minimum use distance (cm):	20
Worst Case Frequency (MHz):	699.97
Maximum EIRP (dBm):	28.90
Maximum EIRP (mW):	776.25
General public - Power density limit (W/m ²):	2.30

Power density at minimum use distance:

Power density (W/m ²):	1.54
Verdict:	PASS

The power density level for this transmission mode is below general public power density limit.

Minimum compliance distance for this technology:

Minimum distance to meet reference level (cm):	16.37
Verdict:	PASS

The minimum use distance is greater than general public minimum compliance distance.

Maximum gain to meet the RSS -102 limits:

Maximum antenna gain to meet reference level (dBi):	6.1
Power density using max antenna gain (W/m ²):	2.284

The power density level using the maximum antenna gain for this transmission mode will be below power density reference level.

Assessment 2 – LTE Band 13

Max output power (dBm):	24.50
Antenna Gain (dBi):	4.4
Minimum use distance (cm):	20
Worst Case Frequency (MHz):	777
Maximum EIRP (dBm):	28.90
Maximum EIRP (mW):	776.25
General public - Power density limit (W/m ²):	2.474

Power density at minimum use distance:

Power density (W/m ²):	1.54
Verdict:	PASS

The power density level for this transmission mode is below general public power density limit.

Minimum compliance distance for this technology:

Minimum distance to meet reference level (cm):	15.80
Verdict:	PASS

The minimum use distance is greater than general public minimum compliance distance.

Maximum gain to meet the RSS -102 limits:

Maximum antenna gain to meet reference level (dBi):	6.4
Power density using max antenna gain (W/m ²):	2.45

The power density level using the maximum antenna gain for this transmission mode will be below power density reference level.

Assessment 3 – WCDMA Band V

Max output power (dBm):	24.00
Antenna Gain (dBi):	3.9
Minimum use distance (cm):	20
Worst Case Frequency (MHz):	826.4
Maximum EIRP (dBm):	27.90
Maximum EIRP (mW):	616.60
General public - Power density limit (W/m ²):	2.58

Power density at minimum use distance:

Power density (W/m ²):	1.23
Verdict:	PASS

The power density level for this transmission mode is below general public power density limit.

Minimum compliance distance for this technology:

Minimum distance to meet reference level (cm):	13.79
Verdict:	PASS

The minimum use distance is greater than general public minimum compliance distance.

Maximum gain to meet the RSS -102 limits:

Maximum antenna gain to meet reference level (dBi):	7.1
Power density using max antenna gain (W/m ²):	2.56

The power density level using the maximum antenna gain for this transmission mode will be below power density reference level.

Assessment 4 – LTE Band 5

Max output power (dBm):	24.5
Antenna Gain (dBi):	3.9
Minimum use distance (cm):	20.0
Worst Case Frequency (MHz):	824.0
Maximum EIRP (dBm):	28.40
Maximum EIRP (mW):	691.83
General public - Power density limit (W/m ²):	2.57

Power density at minimum use distance:

Power density (W/m ²):	1.38
Verdict:	PASS

The power density level for this transmission mode is below general public power density limit.

Minimum compliance distance for this technology:

Minimum distance to meet reference level (cm):	14.62
Verdict:	PASS

The minimum use distance is greater than general public minimum compliance distance.

Maximum gain to meet the RSS -102 limits:

Maximum antenna gain to meet reference level (dBi):	6.6
Power density using max antenna gain (W/m ²):	2.56

The power density level using the maximum antenna gain for this transmission mode will be below power density reference level.

Assessment 5 – LTE Band 4

Max output power (dBm):	24.5
Antenna Gain (dBi):	2.98
Minimum use distance (cm):	20.0
Worst Case Frequency (MHz):	1710.0
Maximum EIRP (dBm):	27.48
Maximum EIRP (mW):	559.76
General public - Power density limit (W/m ²):	4.24

Power density at minimum use distance:

Power density (W/m ²):	1.11
Verdict:	PASS

The power density level for this transmission mode is below general public power density limit.

Minimum compliance distance for this technology:

Minimum distance to meet reference level (cm):	10.25
Verdict:	PASS

The minimum use distance is greater than general public minimum compliance distance.

Maximum gain to meet the RSS -102 limits:

Maximum antenna gain to meet reference level (dBi):	8.7
Power density using max antenna gain (W/m ²):	4.16

The power density level using the maximum antenna gain for this transmission mode will be below power density reference level.

Assessment 6 – WCDMA Band II

Max output power (dBm):	24.0
Antenna Gain (dBi):	2.98
Minimum use distance (cm):	20.0
Worst Case Frequency (MHz):	1850.0
Maximum EIRP (dBm):	26.98
Maximum EIRP (mW):	498.88
General public - Power density limit (W/m ²):	4.47

Power density at minimum use distance:

Power density (W/m ²):	0.99
Verdict:	PASS

The power density level for this transmission mode is below general public power density limit.

Minimum compliance distance for this technology:

Minimum distance to meet reference level (cm):	9.42
Verdict:	PASS

The minimum use distance is greater than general public minimum compliance distance.

Maximum gain to meet the RSS -102 limits:

Maximum antenna gain to meet reference level (dBi):	9.5
Power density using max antenna gain (W/m ²):	4.45

The power density level using the maximum antenna gain for this transmission mode will be below power density reference level.

Assessment 7 – LTE Band 2

Max output power (dBm):	24.5
Antenna Gain (dBi):	2.98
Minimum use distance (cm):	20.0
Worst Case Frequency (MHz):	1850.0
Maximum EIRP (dBm):	27.48
Maximum EIRP (mW):	559.76
General public - Power density limit (W/m ²):	4.475

Power density at minimum use distance:

Power density (W/m ²):	1.11
Verdict:	PASS

The power density level for this transmission mode is below general public power density limit.

Minimum compliance distance for this technology:

Minimum distance to meet reference level (cm):	9.98
Verdict:	PASS

The minimum use distance is greater than general public minimum compliance distance.

Maximum gain to meet the RSS -102 limits:

Maximum antenna gain to meet reference level (dBi):	9.0
Power density using max antenna gain (W/m ²):	4.45

The power density level using the maximum antenna gain for this transmission mode will be below power density reference level.