

SZEMC-TRF-01 Rev. A/0 Aug01.2022

Report No.: SZCR230800247704

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TEST REPORT

Application No.: SZCR2308002477AT

Applicant: Telit Cinterion Deutschland GmbH

Address of Applicant: Siemensdamm 50, Berlin 13629, Germany

Manufacturer: Thales DIS AIS Deutschland GmbH

Address of Manufacturer: Werinherstr. 81, 81541 Munich, Germany

Nanning Fulian Fugui Precision Industrial Co., Ltd. Factory:

Address of Factory: Factory B Foxconn Nanning Industrial Park No. 51, Tongle Road, Nanning

Guangxi 530033 China

Equipment Under Test (EUT):

IoT Module **EUT Name:** Model No.: ELS62-W Trade Mark: **CINTERION** FCC ID: QIPELS62-W

47 CFR Part 1.1307 Standard(s):

47 CFR Part 1.1310

FCC Rules 47 CFR §2.1091

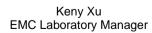
KDB 447498 D04 interim General RF Exposure Guidance v01

2023-08-01 **Date of Receipt:**

Date of Evaluation: 2023-08-01 to 2023-08-28

Date of Issue: 2023-08-29

Evaluation Result: Pass*



Ceny. Ku



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^{*} In the configuration evaluated, the EUT complied with the standards specified above.



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	Revision Record								
Version	Chapter	Date	Modifier	Remark					
01		2023-08-29		Original					

Authorized for issue by:			
	Calvin Weng		
	Calvin Weng/Project Engineer	-	
	Exic Fu		
	Eric Fu/Reviewer	-	



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General Information

3.1 Gene	ral Descri	ption of	E.U.T.
----------	------------	----------	--------

	☐ Portable device
Product Type:	⊠ Mobile device
	☐ Fixed device

3.2 Details of E.U.T.

-	Details of E.G.1.	
	Power supply:	For RF module: DC3.8V
		For mother board: DC12V
	Support Network:	GSM, GPRS, EGPRS
	Operation Frequency Band:	GSM850/PCS1900
	Modulation Type	GMSK for GSM/GPRS/EGPRS;
	Modulation Type:	8PSK for EGPRS;
	GPRS Class:	12
	EGPRS Class:	12
	Antenna Type:	Dipole Antenna
	Antonio Coin	GSM850: 5.17dBi
	Antenna Gain:	PCS1900: 2.17dBi
	LTE Operation Frequency Band:	LTE FDD Band 2,4,5,7,38,40,41(2535MHz-2675MHz),66
	Modulation Type:	QPSK, 16QAM
	LTE Power Class:	Level 3
	Antenna Type:	Dipole Antenna
	Antenna Gain:	LTE B2:2.17dBi, B4: 2.17dBi, B5: 5.17dBi, B7:0dBi; B38: 0dBi; B40:0dBi, B41: 0dBi; B66: 2.17dBi

Remark: The information in this section is provided by the applicant or manufacturer, SGS is not liable to the accuracy, suitability, reliability or/and integrity of the information.

3.3 Separation Distance

Minimum test separation distance:	>20cm

Remark: This minimum test separation distance is determined by the smallest distance from the antenna and radiating structures or outer surface of the device, according to the host form factor, exposure conditions and platform requirements, to any part of the body or extremity of a user or bystander.



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3.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch

No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Nanshan District, Shenzhen, Guangdong, China. 518057.

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

3.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

A2LA (Certificate No. 3816.01)

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

VCCI (Member No. 1937)

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen EMC laboratory have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

FCC –Designation Number: CN1336

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1336. Test Firm Registration Number: 787754.

• Innovation, Science and Economic Development Canada

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

3.6 Deviation from Standards

None

3.7 Abnormalities from Standard Conditions

None



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FCC Radiofrequency radiation exposure limits 4

Test exemptions apply for devices used in general population/uncontrolled exposure environments, according to the SAR-based, or MPE-based exemption thresholds.

4.1 Blanket 1 mW Blanket Exemption

The 1 mW Blanket Exemption of §1.1307(b)(3)(i)(A) applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power of no more than 1 mW, regardless of separation distance.

The 1-mW blanket exemption applies at separation distances less than 0.5 cm, including where there is no separation. This exemption shall not be used in conjunction with other exemption criteria other than those for multiple RF sources in paragraph §1.1307(b)(3)(ii)(A).

The 1-mW exemption is independent of service type and covers the full range of 100 kHz to 100 GHz, but it shall not be used in conjunction with other exemption criteria or in devices with higher-power transmitters operating in the same time-averaging period. Exposure from such higher-power transmitters would invalidate the underlying assumption that exposure from the lower-power transmitter is the only contributor to SAR in the relevant volume of tissue.

4.2 MPE-based Exemption

General frequency and separation-distance dependent MPE-based effective radiated power (ERP) thresholds are in Table B.1 [Table 1 of §1.1307(b)(1)(i)(C)] to support an exemption from further evaluation from 300 kHz through 100 GHz.

Table B.1—Thresholds For Single RF Sources Subject to Routine Environmental Evaluation

RF Source Frequency			Minimum Distance			Threshold ERP
f∟ MHz		f _H MHz	λ _L / 2π λ _H / 2π		λн / 2π	W
0.3	-	1.34	159 m	_	35.6 m	1,920 R ²
1.34	_	30	35.6 m	_	1.6 m	3,450 R ² /f ²
30	_	300	1.6 m	_	159 mm	3.83 R ²
300	_	1,500	159 mm	_	31.8 mm	0.0128 R ² f
1,500	_	100,000	31.8 mm	_	0.5 mm	19.2R ²

Subscripts L and H are low and high; λ is wavelength.

From §1.1307(b)(3)(i)(C), modified by adding Minimum Distance columns.

The table applies to any RF source (i.e. single fixed, mobile, and portable transmitters) and specifies power and distance criteria for each of the five frequency ranges used for the MPE limits. These criteria apply at separation distances from any part of the radiating structure of at least $\lambda/2\pi$. The thresholds are



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based on the general population MPE limits with a single perfect reflection, outside of the reactive near-field, and in the main beam of the radiator.

For mobile devices that are not exempt per Table B.1 [Table 1 of §1.1307(b)(1)(i)(C)] at distances from 20 cm to 40 cm and in 0.3 GHz to 6 GHz, evaluation of compliance with the exposure limits in §1.1310 is necessary if the ERP of the device is greater than *ERP*_{20cm} in Formula (B.1) [repeated from §2.1091(c)(1); also in §1.1307(b)(1)(i)(B)].

$$P_{\rm th} \ ({\rm mW}) = ERP_{\rm 20 \ cm} \ ({\rm mW}) = \begin{cases} 2040 f & 0.3 \ {\rm GHz} \le f < 1.5 \ {\rm GHz} \\ \\ 3060 & 1.5 \ {\rm GHz} \le f \le 6 \ {\rm GHz} \end{cases} \eqno({\rm B.} \ 1)$$

If the ERP is not easily obtained, then the available maximum time-averaged power may be used (i.e., without consideration of ERP only 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.

SAR-based exemptions are constant at separation distances between 20 cm and 40 cm to avoid discontinuities in the threshold when transitioning between SAR-based and MPE-based exemption criteria at 40 cm, considering the importance of reflections.

Limit calculation							
Frequency range	Frequency(MHz)	R(λ/2π)(m)	Threshold ERP(W)				
300~1500MHz	915	0.0522	0.032				
1500~100000MHz	2480	0.0193	0.007				

4.3 SAR-based Exemption

SAR-based thresholds are derived based on frequency, power, and separation distance of the RF source. The formula defines the thresholds in general for either available maximum time-averaged power or maximum time-averaged ERP, whichever is greater.

If the ERP of a device is not easily determined, such as for a portable device with a small form factor, the applicant may use the available maximum time-averaged power exclusively if the device antenna or radiating structure does not exceed an electrical length of $\lambda/4$.

As for devices with antennas of length greater than $\lambda/4$ where the gain is not well defined, but always less than that of a half-wave dipole (length $\lambda/2$), the available maximum time-averaged power generated by the device may be used in place of the maximum time-averaged ERP, where that value is not known.

The separation distance is the smallest distance from any part of the antenna or radiating structure for all persons, during operation at the applicable ERP. In the case of mobile or portable devices, the separation distance is from the outer housing of the device where it is closest to the antenna.



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The SAR-based exemption formula of $\S1.1307(b)(3)(i)(B)$, repeated here as Formula (B.2), applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power or effective radiated power (ERP), whichever is greater, of less than or equal to the threshold P_{th} (mW).

This method shall only be used at separation distances from 0.5 cm to 40 cm and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by Formula (B.2).

$$P_{\text{th}} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \le 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \le 40 \text{ cm} \end{cases}$$
(B. 2)

where

$$x = -\log_{10}\left(\frac{60}{ERP_{20}\,\mathrm{cm}\sqrt{f}}\right)$$

and f is in GHz, d is the separation distance (cm), and ERP_{20cm} is per Formula (B.1).



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Example values shown in Table B.2 are for illustration only.

Table B.2—Example Power Thresholds (mW)

								,		
Frequency		·			Distanc	ce(mm)			·	
(MHz)	5	10	15	20	25	30	35	40	45	50
300	39	65	88	110	129	148	166	184	201	217
450	22	44	67	89	112	135	158	180	203	226
835	9	25	44	66	90	116	145	175	207	240
1900	3	12	26	44	66	92	122	157	195	236
2450	3	10	22	38	59	83	111	143	179	219
3600	2	8	18	32	49	71	96	125	158	195
5800	1	6	14	25	40	58	80	106	136	169

Limit calculation							
Frequency range(GHz) Frequency(GHz) X Distance(cm) Pth (mW)							
0.3~1.5 0.915 1.474 0.5 8.133							
1.5~6	2.48	1.905	0.5	2.717			

2. According to FCC Part1.1310: 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 part1.1307(b)

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm²)	Averaging time (minutes)
(A) Lim	its for Occupational	/Controlled Exposu	res	
0.3–3.0 3.0–30 30–300 300–1500 1500–100,000	614 1842/f 61.4	1.63 4.89/f 0.163	*(100) *(900/f²) 1.0 f/300 5	6 6 6 6
(B) Limits	for General Populati	ion/Uncontrolled Exp	posure	
0.3–1.34 1.34–30 30–300 300–1500 1500–100,000	614 824/f 27.5	1.63 2.19/f 0.073	*(100) *(180/f²) 0.2 f/1500 1.0	30 30 30 30 30

F= Frequency in MHz

Friis Formula



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Friis transmission formula: Pd = (Pout*G)/(4* Pi * R 2)

Where

Pd = power density in mW/cm2

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 id the limit of MPE, 1 mW/cm2. 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.



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5 **Measurement and Calculation**

For LTE:

Output Power Into Antenna & RF Exposure Evaluation Distance(20cm):

Operating Band	Frequency (MHz)	Maximum Conducted Power [dBm] (including tune up)	Maximum EIRP/ERP [dBm] (including tune up)	EIRP/ERP Limit [dBm]	Maximum allowed antenna gain according to EIRP/ERP (dBi)	Maximum allowed antenna gain according to Pd (dBi)	Maximum allowed antenna gain consider all (dBi)
GSM850	824.2	25.31	28.33	38.45	15.29	9.10	9.10
PCS1900	1850.2	22.31	24.48	33.01	10.7	14.7	10.7
LTE B2	1850.7	25	27.17	33.01	8.01	12.01	8.01
LTE B4	1710.7	25	27.17	30	5	12.01	5
LTE B5	824.7	25	28.02	38.45	15.6	9.41	9.41
LTE B7	2502.5	25	25	33.01	8.01	12.01	8.01
LTE B38	2572.5	25	25	33.01	8.01	12.01	8.01
LTE B40	2307.5	23.98	23.98	23.98	0	13.03	0
LTE B41	2537.5	25	25	33.01	8.01	12.01	8.01
LTE B66	1710.7	25	27.17	30	5	12.01	5

Remark: GSM900 and DCS1800 power are time average based power, correction factor is as below:

Number of Time Slot(s)	1	2	3	4
Duty Cycle	1:8.3	1:4.15	1:2.77	1:2.075
Correction factor	-9.19	-6.18	-4.42	-3.17

Max conducted power for GSM=34.5dBm-9.19dBm=25.31dBm,

PCS1900=31.5-9.19=22.31dBm

So, in order to qualify for SAR test exemption, the maximum allowed gain should not be greater than the value above.

-- End of the Report--



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of testing /inspection report & certificate, please contact us at telephone: (86-755) 8307 1443,

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