



SAR Exemption Evaluation Report

Product Name : LocoTrack Primary
Model No. : HGD4, HGP4
FCC ID : 2AYMO-LTP-H4-1

Applicant : System Loco Ltd
Address : Parkfield, Greaves Park, Lancaster

Date of Receipt : May. 25, 2021
Issued Date : Sep. 10, 2021
Report No. : 2150819R-RF-US-P20V01
Report Version : V1.0

The test results presented in this report relate only to the object tested.

The measurement result is considered in conformance with the requirement if it is within the prescribed limit,
It is not necessary to account the uncertainty associated with the measurement result.

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Test Report Certification

Issued Date : Sep. 10, 2021

Report No. : 2150819R-RF-US-P20V01



Product Name : LocoTrack Primary
Trademark : LocoTrack Primary
Applicant : System Loco Ltd
Address : Parkfield, Greaves Park, Lancaster
Manufacturer : Qisda Corp
Address : 169 Zhujiang Road, New District, Suzhou
Model No. : HGD4, HGP4
FCC ID : 2AYMO-LTP-H4-1
Applicable Standard : KDB 447498 D01v06
Test Result : Complied
Performed Location : DEKRA Testing & Certification (Suzhou) Co., Ltd.
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FCC Designation Number: CN1199

Documented By :



(Project Engineer: Scott Shen)

Approved By :



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1. RF Exposure Evaluation

1.1.Limits

According to **KDB 447498 D01 General RF Exposure Guidance v06**

4.3.1 Standalone SAR test exclusion considerations

1) The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

$$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq$$

3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

- $f(\text{GHz})$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to 5) in section 4.1 is applied to determine SAR test exclusion.

2) At 100 MHz to 6 GHz and for test separation distances > 50 mm, the SAR test exclusion threshold is determined according to the following, and as illustrated in Appendix B:

- a) $[\text{Power allowed at numeric threshold for 50 mm in step 1}) + (\text{test separation distance} - 50 \text{ mm}) \cdot (f(\text{MHz})/150)] \text{ mW}$, at 100 MHz to 1500 MHz
- b) $[\text{Power allowed at numeric threshold for 50 mm in step 1}) + (\text{test separation distance} - 50 \text{ mm}) \cdot 10] \text{ mW}$ at > 1500 MHz and ≤ 6 GHz

3) The 1-g and 10-g SAR test exclusion thresholds for below 100 MHz at test separation distances ≤ 50 mm are determined by:

- a) The power threshold at the corresponding test separation distance at 100 MHz in step 2) is multiplied by $[1 + \log(100/f(\text{MHz}))]$ for test separation distances > 50 mm and < 200 mm
- b) The power threshold determined by the equation in a) for 50 mm and 100 MHz is multiplied by $\frac{1}{2}$ for test separation distances ≤ 50 mm
- c) SAR measurement procedures are not established below 100 MHz. When SAR test exclusion cannot be applied, a KDB inquiry is required to determine SAR evaluation requirements for any test results to be acceptable. Note: when the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

1.2. Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

The temperature and related humidity: 18°C and 78% RH.

1.3. Test Result of RF Exposure Evaluation

Product	:	LocoTrack Primary
Test Item	:	RF Exposure Evaluation
Test Site	:	AC-6

Antenna Information

BLUETOOTH

Antenna model	N/A								
Antenna Delivery	☒	1*TX+1*RX		☐	2*TX+2*RX		☐	3*TX+3*RX	
Antenna technology	☒	SISO							
	☐	MIMO	☐	Basic					
			☐	CDD					
			☐	Beam-forming					
Antenna Type	☐	External	☐	Dipole					
	☒	Internal	☐	FPC					
			☒	PCB					
			☐	Ceramic Chip Antenna					
Antenna Gain	3.62 dBi								

WIFI

Antenna model	N/A					
Antenna Delivery	☒	1*TX+1*RX	☐	2*TX+2*RX	☐	3*TX+3*RX
Antenna technology	☒	SISO				
	☐	MIMO	☐	Basic		
	☐		CDD			
	☐		Beam-forming			
Antenna Type	☐	External	☐	Dipole		
	☒	Internal	☐	FPC		
	☒		☒	PCB		
	☐		Ceramic Chip Antenna			
Antenna Gain	3.52 dBi					

GSM/LTE/NBIOT

Antenna model	N/A					
Antenna Delivery	☒	1*TX+1*RX	☐	2*TX+2*RX	☐	3*TX+3*RX
Antenna technology	☒	SISO				
	☐	MIMO	☐	Basic		
	☐		CDD			
	☐		Beam-forming			
Antenna Type	☐	External	☐	Dipole		
	☒	Internal	☐	FPC		
	☒		☒	PIFA		
	☐		Ceramic Chip Antenna			
Antenna Gain	1.62 dBi for GSM 850, LTE Band 5, LTE Band 12, LTE Band 13, LTE Band 26, LTE Band 85, NB-IOT Band 5, NB-IOT Band 12, NB-IOT Band 13, NB-IOT Band 71, NB-IOT Band 85 3.05 dBi for GSM 1900, LTE Band 2, LTE Band 4, LTE Band 25, LTE Band 66, NB-IOT Band 2, NB-IOT Band 4, NB-IOT Band 25, NB-IOT Band 66					

Based on The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm and the formula below:

$$\text{SAR test exclusion thresholds} = \sqrt{f(\text{GHz})} * \frac{(\text{Max Power of channel, mW})}{\text{Min. Separation Distance, mm}}$$

For Bluetooth, the tune-up maximum conducted power we used to calculate RF exposure is -5dBm.

For WIFI, the tune-up maximum conducted power we used to calculate RF exposure is 6dBm.

For GSM/LTE/NB-IOT, the maximum conducted power is from certified module MPE report, which FCC ID is XMR201910BG95M3.

Wireless Configuration	Frequency Range (MHz)	Maximum Conducted Power (dBm)	Maximum Conducted Power with duty cycle correction (dBm)
BT	2400 ~ 2483.5	-5	N/A
WIFI	2400 ~ 2483.5	6	N/A
GSM 850	824 ~ 849	25.97	14.17
GSM 1900	1850 ~ 1910	22.97	11.17
LTE Band 2	1850 ~ 1910	22	10.2
LTE Band 4	1710 ~ 1755	22	10.2
LTE Band 5	824 ~ 849	22	10.2
LTE Band 12	699 ~ 716	22	10.2
LTE Band 13	777 ~ 787	22	10.2
LTE Band 25	1850 ~ 1915	22	10.2
LTE Band 26	814 ~ 849	22	10.2
LTE Band 66	1710 ~ 1780	22	10.2
LTE Band 85	698 ~ 716	22	10.2
NB-IOT Band 2	1850 ~ 1910	22	10.2
NB-IOT Band 4	1710 ~ 1755	22	10.2
NB-IOT Band 5	824 ~ 849	22	10.2
NB-IOT Band 12	699 ~ 716	22	10.2
NB-IOT Band 13	777 ~ 787	22	10.2
NB-IOT Band 25	1850 ~ 1915	22	10.2
NB-IOT Band 66	1710 ~ 1780	22	10.2
NB-IOT Band 71	663 ~ 698	22	10.2
NB-IOT Band 85	698 ~ 716	22	10.2

The duty cycle is very low that only work 1 min every 4 hours for HGD4 and 24 hours for HGP4. When the device is moving there will be nobody close to the device, this mode the duty cycle will increase to 1 min every 15min. The duty cycle of 1min every 15min is used, and duty factor is 11.8dB.

For GSM, LTE and NBIOT, due to the low duty cycle of EUT, the maximum conducted power with duty cycle correction is used for SAR test exclusion.

Standalone operation:

Wireless Configuration	Exposure Condition	Pmax	Pmax	Distance	Frequency (GHz)	Calculation Result	Test Exclusion Threshold	SAR Test
		(dBm)	(mw)	(mm)				
BT	Extremity	-5	0.32	5	2.48	0.10	7.5	No
WIFI	Extremity	6	3.98	5	2.48	1.25	7.5	No
GSM 850	Extremity	14.17	26.12	5	0.85	4.82	7.5	No
GSM 1900	Extremity	11.17	13.09	5	1.91	3.62	7.5	No
LTE Band 2	Extremity	10.2	10.47	5	1.91	2.89	7.5	No
LTE Band 4	Extremity	10.2	10.47	5	1.76	2.78	7.5	No
LTE Band 5	Extremity	10.2	10.47	5	0.85	1.93	7.5	No
LTE Band 12	Extremity	10.2	10.47	5	0.72	1.78	7.5	No
LTE Band 13	Extremity	10.2	10.47	5	0.79	1.86	7.5	No
LTE Band 25	Extremity	10.2	10.47	5	1.92	2.90	7.5	No
LTE Band 26	Extremity	10.2	10.47	5	0.85	1.93	7.5	No
LTE Band 66	Extremity	10.2	10.47	5	1.78	2.79	7.5	No
LTE Band 85	Extremity	10.2	10.47	5	0.72	1.78	7.5	No
NB-IOT Band 2	Extremity	10.2	10.47	5	1.91	2.89	7.5	No
NB-IOT Band 4	Extremity	10.2	10.47	5	1.76	2.78	7.5	No
NB-IOT Band 5	Extremity	10.2	10.47	5	0.85	1.93	7.5	No
NB-IOT Band 12	Extremity	10.2	10.47	5	0.72	1.78	7.5	No
NB-IOT Band 13	Extremity	10.2	10.47	5	0.79	1.86	7.5	No
NB-IOT Band 25	Extremity	10.2	10.47	5	1.92	2.90	7.5	No
NB-IOT Band 66	Extremity	10.2	10.47	5	1.78	2.79	7.5	No
NB-IOT Band 71	Extremity	10.2	10.47	5	0.70	1.75	7.5	No
NB-IOT Band 85	Extremity	10.2	10.47	5	0.72	1.78	7.5	No

Simultaneous transmission operation:

The EUT support simultaneously transmit with BT + WIFI + GSM/LTE/NB-IOT.

The worst simultaneous transmission operation is BT + WIFI + GSM850, the calculation result is as below

Wireless Configuration	Exposure Condition	Standalone Calculation Result			Simultaneous Calculation Result	Test Exclusion Threshold	SAR Test
		BT	WIFI	GSM850			
BT + WIFI + GSM850	Extremity	0.10	1.25	4.82	6.17	7.5	No

Conclusion: The EUT need no SAR test.

_____ The End _____