RF Exposure Evaluation

FOR

Descartes System Group Inc

Inventory control beacon tag

Test Model: BIN001-1

Prepared for	:	Descartes System Group Inc
Address	:	105 Trafalgar Street, Floor 2 Floor 2, Nelson, New Zealand
Prepared by	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Address	:	101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Yabianxueziwei, Shajing Street, Baoan District, Shenzhen, 518000, China
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Date of receipt of test sample	:	March 31, 2025
Number of tested samples	:	2
Sample No.	:	A03275109-1, A03275109-2
Serial number	:	Prototype
Date of Test	:	March 31, 2025 ~ April 10, 2025
Date of Report	:	April 11, 2025

RF Exposure Evaluation		
Report Reference No.	:	**LCSA03275109EC**
Date of Issue.....	:	April 11, 2025
Testing Laboratory Name.....	:	**Shenzhen LCS Compliance Testing Laboratory Ltd.**
Address.....	:	101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Yabianxueziwei, Shajing Street, Baoan District, Shenzhen, 518000, China
Testing Location/ Procedure.....	:	Full application of Harmonised standards ■ Partial application of Harmonised standards □ Other standard testing method □
Applicant's Name.....	:	**Descartes System Group Inc**
Address.....	:	105 Trafalgar Street, Floor 2 Floor 2, Nelson, New Zealand
Test Specification		
Standard.....	:	FCC KDB publication 447498 D01 General RF Exposure Guidance v06 FCC CFR 47 part1 1.1310 FCC CFR 47 part2 2.1093
Test Report Form No.....	:	TRF-4-E-215 A/0
TRF Originator.....	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Master TRF.....	:	Dated 2011-03

Test Item Description.....	:	**Inventory control beacon tag**
Trade Mark.....	:	N/A
Test Model.....	:	BIN001-1
Ratings.....	:	DC 3V By CR2477 Button Battery
Result	:	PASS

Compiled by:	Supervised by:	Approved by:
Kevin Huang	Jack Liu	
Kevin Huang/Administrator	Jack Liu/ Technique principal	Gavin Liang/ Manager

RF Exposure Evaluation

Test Report No. : **LCSA03275109EC**	April 11, 2025 Date of issue

Test Model.....	: BIN001-1
EUT.....	: Inventory control beacon tag
Applicant.....	**: Descartes System Group Inc**
Address.....	: 105 Trafalgar Street, Floor 2 Floor 2, Nelson, New Zealand
Telephone.....	: /
Fax.....	: /
Manufacturer.....	**: Descartes System Group Inc**
Address.....	: 105 Trafalgar Street, Floor 2 Floor 2, Nelson, New Zealand
Telephone.....	: /
Fax.....	: /
Factory.....	: **Descartes System Group Inc**
Address.....	: 105 Trafalgar Street, Floor 2 Floor 2, Nelson, New Zealand
Telephone.....	: /
Fax.....	: /

Test Result	**PASS**

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Revision History

Report Version	Issue Date	Revision Content	Revised By
000	April 11, 2025	Initial Issue	---

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Description **Page**

1. Product Information

Product name	:	Inventory control beacon tag
Test Model	:	BIN001-1
Ratings	:	DC 3V By CR2477 Button Battery
Hardware Version	:	BIN001-1
Software Version		/
Bluetooth Frequency Range	:	2402MHz~2480MHz
Channel Number	:	40 channels for Bluetooth V5.0 (DTS)
Channel Spacing	:	2MHz for Bluetooth V5.0 (DTS)
Modulation Type	:	GFSK for Bluetooth V5.0 (DTS)
Bluetooth Version	:	V5.0
Antenna Type	:	Internal Antenna
Antenna Gain	:	3.2dBi
NFC Operating Frequency	:	13.56MHz
Modulation Type	:	ASK
Antenna Type	:	PCB Antenna
Antenna Gain	:	0dBi
Exposure category	:	General population/uncontrolled environment
EUT Type	:	Production Unit
Device Type	:	Portable Device

Note: For a more detailed antenna description, please refer to the antenna specifications or the antenna report provided by the customer.

2. Evaluation method and Limit

According to KDB447498 D01 General RF Exposure Guidance v06 Section 4.3.1 Standalone SAR test exclusion considerations: “Unless specifically required by the published RF exposure KDB procedures, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding SAR Test Exclusion Threshold condition, listed below, is satisfied. These test exclusion conditions are based on source-based time-averaged maximum conducted output power of the RF channel requiring evaluation, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions.22 The 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 (see 5) of section 4.1). To qualify for SAR test exclusion, the test separation distances applied must be fully explained and justified by the operating configurations and exposure conditions of the transmitter and applicable host platform requirements, typically in the SAR measurement or SAR analysis report, according to the required published RF exposure KDB procedures. When no other RF exposure testing or reporting is required, a statement of justification and compliance must be included in the equipment approval, in lieu of the SAR report, to qualify for the SAR test exclusion. When required, the device specific conditions described in the other published RF exposure KDB procedures must be satisfied before applying these SAR test exclusion provisions; for example, handheld PTT two-way radios, handsets, laptops & tablets etc.“

[(max. power of channel, including tune-up tolerance, mW)/ (min. test separation distance, mm)] · [√f (GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where:

- f (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 f) in section 4.1 is applied to determine SAR test exclusion.

When one of the following test exclusion conditions is satisfied for all combinations of simultaneous transmission configurations, further equipment approval is not required to incorporate transmitter modules in host devices that operate in the mixed mobile and portable host platform exposure conditions. The grantee is responsible for documenting this according to Class I permissive change requirements. Antennas that qualify for standalone SAR test exclusion must apply the estimated standalone SAR to determine simultaneous transmission test exclusion.

a) The [∑ of (the highest measured or estimated SAR for each standalone antenna configuration, adjusted for maximum tune-up tolerance) / 1.6 W/kg] + [∑ of MPE ratios] is ≤ 1.0.

b) The SAR to peak location separation ratios of all simultaneously transmitting antenna pairs operating in portable device exposure conditions are all ≤ 0.04, and the [∑ of MPE ratios] is ≤ 1.0.

c) For frequencies below 100 MHz, the following may be considered for SAR test exclusion (also illustrated in Appendix C):33

1) For test separation distances > 50 mm and < 200 mm, the power threshold at the corresponding test separation distance at 100 MHz in step b) is multiplied by [1 + log(100/famz)].

2) For test separation distances ≤ 50 mm, the power threshold determined by the equation in c) 1) for 50 mm and 100 MHz is multiplied by ½.

3) SAR measurement procedures are not established below 100 MHz.

3. Refer Evaluation Method

ANSI C95.1–1999: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

FCC KDB publication 447498 D01 General RF Exposure Guidance v06: Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

FCC CFR 47 part1 1.1310: Radiofrequency radiation exposure limits.

FCC CFR 47 part2 2.1093: Radiofrequency radiation exposure evaluation: portable devices

4. Conducted Power Results

< BLE 1M >

Mode	Channel	Frequency (MHz)	Peak Conducted Output Power (dBm)
GFSK	0	2402	0.81
	19	2440	1.03
	39	2480	0.03

< BLE 2M >

Mode	Channel	Frequency (MHz)	Peak Conducted Output Power (dBm)
GFSK	0	2402	0.66
	19	2440	0.89
	39	2480	-0.16

<NFC>

Mode	Frequency (MHz)	Peak Conducted Output Power (dBm)
ASK	13.56	-50.99

Note:

TX frequency range: 13.56MHz

Device category: Portable device (Distance: 5mm) Max. Field Strength: 44.26dBuV/m @3m

EIRP=E-104.8+20logD=44.26-104.8+20log3=-50.99dBm

Maximum Conducted Output Power: -50.99dBm

Turn-up: -51±1dBm

5. Manufacturing Tolerance

< BLE 1M >

GFSK (Peak)			
Channel	Channel 0	Channel 19	Channel 39
Target (dBm)	0	1.0	0
Tolerance ±(dB)	1.0	1.0	1.0

< BLE 2M >

GFSK (Peak)			
Channel	Channel 0	Channel 19	Channel 39
Target (dBm)	0	0	0
Tolerance ±(dB)	1.0	1.0	1.0

<NFC>

ASK (Peak)	
Frequency (MHz)	13.56
Target (dBm)	-51
Tolerance ±(dB)	1.0

6. Evaluation Results

6.1 Standalone Evaluation (BLE)

Band/Mode		f (GHz)	Antenna Distance (mm)	RF output power		SAR Test Exclusion Threshold	SAR Test Exclusion
				dBm	mW		
BLE 1M	GFSK	2.440	5	2.0	1.5849	0.4951< 3.0	Yes
BLE 2M	GFSK	2.480	5	1.0	1.2589	0.3965< 3.0	Yes

Remark:

1. Output power including tune up tolerance;

2. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to f) in section 4.1 is applied to determine SAR test exclusion.

6.2 Standalone Evaluation (NFC)

Mode	f (MHz)	Antenna Distance (mm)	Max. Field Strength(dBuV/m @3m)	Max. Conducted Output Power(dBm)	Output power (Max. Turn-up Procedure) (mW)	Limit P_{th}(mW)
ASK	13.56	5	44.26	-50	0.00000001	443

6.3 Simultaneous Transmission for SAR Exclusion

BLE Ant Max MPE (Ratio)	NFC Ant Max MPE (Ratio)	simultaneous MPE (Ratio)	MPE Limits (Ratio)
0.4951	0.00000001	0.49510001	1.0000

7. Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1093 for the uncontrolled RF Exposure and SAR Exclusion Threshold per KDB 447498 v06.

8. Description of Test Facility

NVLAP Accreditation Code is 600167-0.
FCC Designation Number is CN5024.
CAB identifier is CN0071.
CNAS Registration Number is L4595.
Test Firm Registration Number: 254912.

9. Measurement Uncertainty

BLE/NFC:

Test Item		Frequency Range	Uncertainty	Note
Radiation Uncertainty	:	9KHz~30MHz	±3.10dB	(1)
		30MHz~200MHz	±2.96dB	(1)
		200MHz~1000MHz	±3.10dB	(1)
		1GHz~26.5GHz	±3.80dB	(1)
		26.5GHz~40GHz	±3.90dB	(1)
Conduction Uncertainty	:	150kHz~30MHz	±1.63dB	(1)
Power disturbance	:	30MHz~300MHz	±1.60dB	(1)
Output power	:	1GHz-40GHz	±0.57dB	(1)
Occupied Channel Bandwidth	:	1GHz-40GHz	±5%	(1)

(1). This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

.....THE END OF REPORT.....