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Smart Start Inc.

SAR EXEMPTION

REPORT

SCOPE OF WORK

SAR EXEMPTION CALCULATION

ON THE ORBIS

REPORT NUMBER

105392576LEX-003.1

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SAR EXEMPTION TEST REPORT

Report Number: 105392576LEX-003.1
Project Number: G105392576

Report Issue Date: 6/28/2023
Report Revised Date: 1/5/2024

Product Name: ORBIS
Model ORBIS

Standards: FCC Part 2.1093

Tested by:
Intertek Testing Services NA, Inc.
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Client:
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1 Introduction and Conclusion

SAR exemption calculations were performed on the product constructed as described in section 4. Information provided by the client including maximum output power, antenna gain(s), and minimum separation distance(s) was used to determine if the product under evaluation was exempt from SAR. Any change in these stated values may invalidate these results. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product under evaluation is **exempt** from SAR requirements for each of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) evaluated. Intertek does not make any claims of compliance for samples or variants which were not evaluated.

2 Test Summary

Section	Requirement	Result
5	FCC SAR Exemption Criteria (FCC Title 47 CFR Part 1.1307, 2.1093)	Exempt from SAR



3 Client Information

This product was tested at the request of the following:

Client Information	
Client Name:	Smart Start Inc.
Address:	500 E. Dallas Rd Suite 100 Grapevine, TX 76051 USA
Contact:	Gordon Harrison
Telephone:	+1 (214) 498-9821
Email:	gordon.harrison@smartstartinc.com
Manufacturer Information	
Manufacturer Name:	Smart Start Inc.
Manufacturer Address:	500 E. Dallas Rd Suite 100 Grapevine, TX 76051 USA



4 Description of Equipment under Test and Variant Models

Equipment Under Test	
Product Name	ORBIS
Model Number	ORBIS
FCC Identifier	2BA9A11679
Type of Transmission	LTE Cat M1, Cat NB1
Rated RF Output Power¹	23 dBm
Antenna(s) and Gain¹	Custom antenna, 0.6 dBi
Frequency Range	B2: 1850 – 1910 MHz B4: 1710 – 1785 MHz B12: 699 – 716 MHz B13: 777 – 787 MHz
Type of Modulation / Data Rate	OFDMA, 16-QAM
Description of Equipment Under Test (provided by client)	
Wearable alcohol detection system	

4.1 Variant Models:

There were no variant models covered by this evaluation.

¹ This information was provided by the client and may affect compliance. Intertek does not make any claims of compliance for values other than those shown.



4.2 Maximum Output Power

The following information was taken from the nRF9160 Hardware Integration Guide v1.0 provided by Smart Start Inc. and may affect compliance. Intertek does not make any claims of compliance for values other than those shown below.

Parameter	Range	Description
3GPP band number	1 to 66	nRF9160 supported bands
Frequency 100 kHz raster	6000 to 22000	Corresponds to 600 to 2200 MHz
System mode	0 to 1	NB1 = 0, M1 = 1
Signal level at antenna	-50 to +23	TX signal level at antenna port [dBm]
Modulation	CW to 16QAM	TX signal properties - options available depending on selected system mode
RB or SC count	1 to 12	TX signal properties - options available depending on selected system mode
RB or SC start position	0 to 11	TX signal properties - options available depending on selected system mode



4.3 Duty Factor Calculation

The following information was provided by the client and may affect compliance. Intertek does not make any claims of compliance for values other than shown below.

The device connects to a cell tower once an hour to upload logs and execute any queued-up tasks. Connecting to a cell tower and then our gateway can take a maximum of about 10 seconds but on average about 3 seconds. If it is unable to connect, it will try again in an hour. Once connected, it will upload log data which on average will take about 5 to 20 seconds, depending on how often the device was able to connect previously. A Firmware update is the one task that can take more than 3 minutes to complete. Regardless of how long an operation takes, once connected to a cell tower, the device will timeout if it exceeds the maximum connection time (60 seconds) and will resume the operation on the next connect.

The maximum accumulated transmission time in any 30-minute sliding window is 60 seconds, and the corresponding duty factor is:

$$\frac{60s}{30 \cdot 60s} \times 100\% = 3.33\% = -14.8dB$$



5 FCC SAR Exemption Criteria

FCC Title 47 CFR Part 1.1307(3)(i):

For single RF sources (i.e., any single fixed RF source, mobile device, or portable device, as defined in paragraph (b)(2) of this section): A single RF source is exempt if:

- (A) The available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption may not be used in conjunction with other exemption criteria other than those in paragraph (b)(3)(ii)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(ii)(A);
- (B) Or the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P_{th} (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by:

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

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

d = the separation distance (cm);

FCC KDB 447498 D04 Interim General RF Exposure Guidance v01 § 2.2.1:

Finally, when 10-g extremity SAR applies, SAR test exemption may be considered by applying a factor of 2.5 to the SAR-based exemption thresholds.

RF Source	Frequency (GHz)	Separation Distance (cm)	Output Power (mW/dBm)	Duty Factor (%/dB)	Average Output Power (mW/dBm)	P_{th} (mW/dBm)	Exempt from SAR?
Band 2	1.85	0.5	200mW 23dBm	3.33% -14.8dB	6.7mW 8.2dBm	8.6mW 9.3dBm	Exempt
Band 4	1.71	0.5	200mW 23dBm	3.33% -14.8dB	6.7mW 8.2dBm	9.1mW 9.6dBm	Exempt
Band 12	0.699	0.5	200mW 23dBm	3.33% -14.8dB	6.7mW 8.2dBm	29.7mW 14.7dBm	Exempt
Band 13	0.777	0.5	200mW 23dBm	3.33% -14.8dB	6.7mW 8.2dBm	25.6mW 14.1dBm	Exempt



6 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	6/28/2023	105392576LEX-003	BZ	JTS	Original Issue
1	1/5/2024	105392576LEX-003.1	BZ	JTS	Updated FCCID