RF Exposure Report (Portable Conditions)

Prepared for Novanta

This report presents Maximum Permissible Exposure for

M1-MINI

Prepared by

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Engineer

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• Test Request Information

Test Requested By:	Novanta
	125 Middlesex Turnpike, Bedford, MA 01730
	Bedford, MA 01730
Category of DUT:	Portable Exposure; General Population / Uncontrolled Exposure
Type of Test:	RF Exposure Exemption Calculation
References:	KDB 447498 v06
	FCC CFR Title 47, Chapter I, Subchapter A, Subpart I, Part 2.1091
Deviations from standard:	None
Date of Assessment:	05/25/2022

• Test Laboratory Information

Location of Test Lab:	Bureau Veritas Consumer Product Services, Inc.
	One Distribution Center Circle,
	Ste #1,
	Littleton, MA 01460, USA
Key Contact:	Ozgur Ozturk (General Manager)
	Ozgur Ozturk@BureauVeritas.com
Laboratory Accreditations:	BUREAU VERITAS CONSUMER PRODUCTS SERVICES, INC is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories.
ISO/IEC 17025:2017:	1627-01
FCC Test Site Number:	US1028
IC Test Site Number:	US0106

1. RF Exposure

1.1 Limits for Maximum Permissible Exposure (MPE)

Following FCC KDB 447498 D01 "General SAR test exclusion guidance"

a) For 100 MHz to 6 GHz and test separation distances ≤ 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:
[(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
- The values 3.0 and 7.5 are referred to as numeric thresholds in step b) 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 4.1 f) is applied to determine SAR test exclusion.

b) For 100 MHz to 6 GHz and test separation distances > 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following (also illustrated in Appendix B):

1) {[Power allowed at numeric threshold for 50 mm in step a)] + [(test separation distance – 50 mm) ·(f(MHz)/150)]} mW, for 100 MHz to 1500 MHz

2) {[Power allowed at numeric threshold for 50 mm in step a)] + [(test separation distance – 50 mm) ·10]} mW, for > 1500 MHz and ≤ 6 GHz

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

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/f(MHz))]

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

1.2 MPE Calculation Formula

$$S = \frac{P_{out}G}{4\pi R^2}$$

Where:

S = power density in mW/cm^2
P_{out} = output power to antenna in mW

G = gain of antenna in linear scale
R = distance between observation point and centre of the radiator in cm

1.3 Classification

The antenna of this product, under normal use condition, is at 0mm seperation away from the body of the user. Therefore this device is classified as Portable Device.

1.4 Antenna information

Antenna Type
4 Loop Coil Antenna on PCB

1.5 Determining EIRP

The following calculation was used to convert field strength measurement at 3 meters to dBm EIRP.

EIRP(dBm) = E(dBμV/m) − 95.3

Highest Measured Field Strength = 61.9 dBuV/m = -33.4 dBm EIRP = 0.00046 mWatts EIRP

1.6 Calculation Result of Single RF Source(s)

Following FCC KDB 447498 D01 "General SAR test exclusion guidance

a) For 100 MHz to 6 GHz and test separation distances ≤ 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:
[(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
- The values 3.0 and 7.5 are referred to as numeric thresholds in step b) 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 4.1 f) is applied to determine SAR test exclusion.

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

SAR Test Exclusion Threshold for < 100 MHz and < 200 mm as per Appendix C

SAR exclusion for 100MHz at 50mm is 237mW

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/f(MHz))]

237 x [1+log (100/13.56)] = 442mW

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

= 221mW

Transmit power of the device << 221mW

This device is excluded from SAR evaluation