RF Exposure Report

Report No.:	MFBCKS-WTW-P23040515
FCC ID:	2AWHPR231
Test Model:	UTR-231
Received Date:	2023/4/25
Test Date:	2023/6/20
Issued Date:	2023/7/4
Applicant:	Space Exploration Technologies Corp. (SPACEX)
Address:	1 Rocket Rd., Hawthorne, CA 90250 USA
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory
Lab Address:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan
Test Location:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan
FCC Registration / Designation Number:	723255 / TW2022

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Release Control Record

Issue No.	Description	Date Issued
MFBCKS-WTW-P23040515	Original release.	2023/7/4

1 Certificate of Conformity

Product: Starlink Router

Brand: SPACEX

Test Model: UTR-231

Sample Status: Engineering sample

Applicant: Space Exploration Technologies Corp. (SPACEX)

Test Date: 2023/6/20

FCC Rule Part: FCC Part 2 (Section 2.1091)

Standard: KDB 447498 D01 General RF Exposure Guidance v06

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : Vito Lung , **Date:** **2023/7/4**

Vito Lung / Specialist

Approved by : , **Date:** **2023/7/4**

May Chen / Manager

2 RF Exposure

2.1 Limits for Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Average Time (minutes)
Limits For General Population / Uncontrolled Exposure				
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	($180/f^2$)*	30
30-300	27.5	0.073	0.2	30
300-1500	…	…	f/1500	30
1500-100,000	…	…	1.0	30

f = Frequency in MHz ; *Plane-wave equivalent power density

2.2 MPE Calculation Formula

$Pd = (Pout*G) / (4*pi*r^2)$

where

Pd = power density in mW/cm^2

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

2.3 Classification

The antenna of this product, under normal use condition, is at least 20 cm away from the body of the user. So, this device is classified as **Mobile Device**.

2.4 Antenna Gain

Antenna NO.	RF Chain NO.	Brand	Model	Antenna Net Gain(dBi)	Frequency range	Antenna Type	Connector Type
2G1	Ant1	SPACEX	UTR-231	4.26	2.4~2.4835GHz	PIFA	ipex(MHF)
2G2	Ant2			4.13	2.4~2.4835GHz	PIFA	ipex(MHF)
2G3	Ant3			3.14	2.4~2.4835GHz	PIFA	ipex(MHF)
2G4	Ant4			3.92	2.4~2.4835GHz	PIFA	ipex(MHF)
5L1	Ant1	SPACEX	UTR-231	2.86	5.15~5.25GHz	PIFA	ipex(MHF)
				4.20	5.25~5.35GHz		
5L2	Ant2			2.28	5.15~5.25GHz	PIFA	ipex(MHF)
				1.04	5.25~5.35GHz		
5L3	Ant3			1.29	5.15~5.25GHz	PIFA	ipex(MHF)
				1.68	5.25~5.35GHz		
5L4	Ant4			1.53	5.15~5.25GHz	PIFA	ipex(MHF)
				1.51	5.25~5.35GHz		
5H1	Ant1	SPACEX	UTR-231	4.02	5.47~5.725GHz	PIFA	ipex(MHF)
				4.23	5.725~5.85GHz		
5H2	Ant2			4.02	5.47~5.725GHz	PIFA	ipex(MHF)
				3.72	5.725~5.85GHz		
5H3	Ant3			3.04	5.47~5.725GHz	PIFA	ipex(MHF)
				3.93	5.725~5.85GHz		
5H4	Ant4			4.90	5.47~5.725GHz	PIFA	ipex(MHF)
				3.27	5.725~5.85GHz		

* Detail antenna specification please refer to antenna datasheet and/or antenna measurement report.

2.5 Calculation Result of Maximum Conducted Power

For WLAN - CDD Mode

Operation Mode	Evaluation Frequency (MHz)	Max Avg. Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)	Result
WLAN 2.4 GHz	2412-2462	859.765	4.26	20	0.12636	1	Pass
WLAN 5 GHz(L)	5180-5240	969.319	2.86	20	0.10320	1	Pass
WLAN 5 GHz(H)	5745-5825	961.078	4.23	20	0.14028	0.442	Pass

For WLAN - Beamforming Mode

Operation Mode	Evaluation Frequency (MHz)	Max Avg. Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)	Result
WLAN 2.4 GHz	2412-2462	891.671	5.81	20	0.18725	1	Pass
WLAN 5 GHz(L)	5180-5240	947.638	6.21	20	0.21821	1	Pass
WLAN 5 GHz(H)	5745-5825	961.078	6.14	20	0.21776	0.442	Pass

NOTE:

1. For MPE calculation is based on the PSD Effective Legacy Gain.
2. Pls, take care MPE distance on warning statement, because distance to Human body is over 20cm
3. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

Conclusion:

The formula of calculated the MPE is:

CPD1 / LPD1 + CPD2 / LPD2 + ……etc. < 1

CPD = Calculation power density

LPD = Limit of power density

WLAN - CDD Mode

WLAN 2.4 GHz + WLAN 5 GHz(L) + WLAN 5 GHz(H) = 0.12636 / 1 + 0.10320 / 1 + 0.14028 / 0.442 = 0.54694

WLAN - Beamforming Mode

WLAN 2.4 GHz + WLAN 5 GHz(L) + WLAN 5 GHz(H) = 0.18725 / 1 + 0.21821 / 1 + 0.21776/ 0.442 = 0.89813

Therefore the maximum calculations of above situations are less than the "1" limit.

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