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STARRY, INC.
MPE REPORT

SCOPE OF WORK
MPE CALCULATION – 24 GHz Titan Radio, Model Titan 24X45

REPORT NUMBER
104910448BOX-001.1

ISSUE DATE
June 16, 2022

PAGES
10

DOCUMENT CONTROL NUMBER
Non-Specific Radio Report Shell Rev. December 2017
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MPE REPORT

(FULL COMPLIANCE)

Report Number: 104910448BOX-001.1
Project Number: G104910448

Report Issue Date: June 16, 2022

Model(s) Tested: 24 GHz Titan Radio, Model Titan 24X45

Standards: **FCC Part 1 Subpart I, February 2022**
Procedures Implementing the National Environmental Policy Act of 1969
§1.1307 Actions that may have a significant environmental effect, for which Environmental Assessments (EAs) must be prepared.

Tested by:	Client:
Intertek	Starry, Inc.
70 Codman Hill Road	38 Chauncy St, Suite 200
Boxborough, MA 01719	Boston, MA 02111
USA	USA

Report prepared by	Report reviewed by
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1 Introduction and Conclusion

This evaluation report covers for a mobile device subject to routine environmental evaluation for RF exposure. A mobile device is defined as a transmitting device designed to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structurer(s) and the body of the user or nearby persons.

The evaluation indicated in section 2.0 were performed on the product constructed as described in section 4.0. The remaining sections are the verbatim text from the actual evaluation during the investigation. These sections include the evaluation name, the specified Method, and 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 evaluated **complies** with the requirements of the standard(s) indicated. The results obtained in this 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 Evaluation Summary

Section	Test full name	Result
3	Client Information	-
4	Description of Equipment Under Evaluation and Variant Models	-
5	System Setup and Method	-
6	Power Density Calculation (FCC §1.1310)	Compliant
7	Revision History	-

3 Client Information

This EUT was evaluated at the request of:

Client: Starry, Inc.
38 Chauncy St, Suite 200
Boston, MA 02111
USA

Contact: Robert White
Telephone: (617) 297-9559
Email: rwhite@starry.com

4 Description of Equipment Under Test and Variant Models

Manufacturer: Starry, Inc.
38 Chauncy St, Suite 200
Boston, MA 02111
USA

Description of Equipment Under Test (provided by client)

The equipment under test is a Multipoint Radio with integrated Bluetooth Low Energy (BLE) and 5 GHz transmitters. The BLE radio is used only during installation to add technicians for a very short period. The 24 GHz is active during that time and establishing a link / passing traffic. The BLE does not operate after installation is completed, except on site visit, which is rare. 5 GHz radio is always associated. It sends beacons 100% of the time on 5 GHz. It operates at the same time as the 24 GHz, and for a very short period of time with the BLE.

Equipment Under Test Power Configuration			
Rated Voltage	**Rated Current**	**Rated Frequency**	**Number of Phases**
48 VDC	5.84 A	DC	N/A

Variant Models:

The following variant models have been identified by the manufacturer as being electrically identical models, depopulated models, or with reasonable similarity to the model(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

None

5 Power Density Calculation

5.1 Requirement(s)

FCC §1.1310 Radiofrequency radiation exposure limits

Table 1 below sets forth limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic field.

Table 1 to §1.1310(e)(1) – Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power Density (mW/cm²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f²	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*100	30
1.34-30	842/f	2.19/f	*180/f²	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
1,500-100,000			1.0	30

F = frequency in MHz * = Plane-wave equivalent power density

5.2 Method

An MPE evaluation was performed in order to show that the device was compliant with FCC §2.1091 and ISED RSS-102. The maximum power density was calculated for each transmitter at a separation distance of 20 cm. The calculation was performed using the maximum gain from the internal and external antennas declared by the manufacturer.

The maximum permissible exposure (MPE) is predicted by using the following equation:

$$S = PG/4\pi R^2$$

where: S = power density (in appropriate units, e.g. mW/cm^2)
P = power input to the antenna (in appropriate units, e.g., mW)
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

5.3 Calculation:

Technology	Frequency (MHz)	Conductied Power (dBm)	Antenna Gain (dBi)	EIRP Power (dBm)	EIRP Power (mW)	Safe distance (cm)	Safe distance (m)
24 GHz Radio	24970	-	-	59.96	990831.94489	281	2.81

5.4 Results:

The sample tested was found to Comply. Based on calculation presented in §5.3, the safety distance is 281 cm to comply with the limits for general population / uncontrolled exposure.

5.5 Results – Human RF Exposure

Limit for Maximum Permissible Exposure (MPE)

FCC Human RF Exposure Limits:

The FCC §1.1310 The criteria listed in table 1 was used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices shall be evaluated according to the provisions of §2.1093 of this chapter.

Part §1.1310 Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f^2	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
(B) 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
300-1,500			f/1500	30
1,500-100,000			1.0	30

f = frequency in MHz * = Plane-wave equivalent power density

(1) Occupational/controlled exposure limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when a person is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure. The phrase *fully aware* in the context of applying these exposure limits means that an exposed person has received written and/or verbal information fully explaining the potential for RF exposure resulting from his or her employment. With the exception of *transient* persons, this phrase also means that an exposed person has received appropriate training regarding work practices relating to controlling or mitigating his or her exposure. Such training is not required for *transient* persons, but they must receive written and/or verbal information and notification (for example, using signs) concerning their exposure potential and appropriate means available to mitigate their exposure. The phrase *exercise control* means that an exposed person is allowed to and knows how to reduce or avoid exposure by administrative or engineering controls and work practices, such as use of personal protective equipment or time averaging of exposure.

(2) General population/uncontrolled exposure limits apply in situations in which the general public may be exposed, or in which persons who are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

MPE Safe Distance Calculation

RF exposure for licensed transmitter is handled at the time of licensing, however, an MPE calculation was performed in order to show the distance at which the device is compliant with the limits of §1.1310. The highest measured EIRP output power was used.

FCC Limit For General Population/Uncontrolled Exposure at 24 GHz = 1 mW/cm^2

Power Density = [EIRP] / [4π x $(D_{cm})^2$]

Where EIRP is in milliwatts and D is in centimeters. Setting the power density equal to the limit of 1 mW/cm^2 and solving for D_{cm} yields the following results.

Results:
EUT EIRP = EIRP Output Power+ Array Gain in dBi + Beam Forming in dBi

Power Density Limit = [EIRP] / [4π x $(D_{cm})^2$]
1 mW/cm^2 = [EIRP] / [4π x $(D_{cm})^2$]
D_{cm} = ([EIRP] / [4π])$^{1/2}$, where maximum EIRP = 59.96 dBm or 990831.94489 mW
Safe Distance, D_{cm} = 281 cm = 2.81 m

Note: Worst-case output power from Intertek Report #104910448BOX-001 was used for the calculation.

6 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	06/16/2022	104910448BOX-001.1	KPS KPS	VFV VFV	Original Issue