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Starry, Inc.
Human RF Exposure Report

SCOPE OF WORK
Human RF Exposure – Model Titan 37

REPORT NUMBER
105391852BOX-001c

ISSUE DATE
September 13, 2023

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HUMAN RF EXPOSURE REPORT

(FULL COMPLIANCE)

Report Number: 105391852BOX-001c
Project Number: G105391852

Report Issue Date: September 13, 2023

Model(s) Tested: Titan 37

Standards: FCC 47 CFR Part 1.1307(b),
FCC 47 CFR Part 1.1310,
FCC 47 CFR Part 2.1091,
FCC 47 CFR Part 2.1093

Tested by:
Intertek
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USA

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

Report prepared by

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Table of Contents

1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 4.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. 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 tested **complies** with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

2 Test Summary

Section	Test full name	Result
3	Client Information	--
4	Description of Equipment Under Test and Variant Models	--
5	Human RF Exposure FCC 47 CFR Part 1.1307(b), FCC 47 CFR Part 1.1310, FCC 47 CFR Part 2.1091, FCC 47 CFR Part 2.1093	Pass
6	Revision History	--

3 Client Information

This EUT was tested at the request of:

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

Contact: Justin Ayvazian
Telephone: None
Email: jayvazian@starry.com

4 Description of Equipment Under Test and Variant Models

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
See below	Starry, Inc.	Titan 37	2045200059

Description of Equipment Under Test (provided by client)
The equipment under test (EUT) is a Titan37 mmWave based station access point, operating between 37-40 GHz. It utilizes OFDMA IEEE 802.11ac, MCS0-MCS9. Channel bandwidths are 160 MHz and 20 MHz unconverted and transmitted/received at mmWave frequencies between 37 GHz and 40 GHz. Signals are conveyed in two polarizations – horizontal and vertical through patch array with a lens antenna. The antenna is a patch array (4x8) for each polarization and a lens. There are 4 1x8 columns per polarization. The Titan37 base station is typically pole-mounted or building mounted.

Radio/Receiver Characteristics	
Frequency Band(s)	37.170-39.970 GHz
Modulation Type(s)	OFDMA
Maximum Output Power	55.2 dBm EIRP (With 4 Paths + beamforming, per pol)
Test Channels	37.170 GHz, 38.570 GHz, 39.970 GHz 37.100 GHz, 38.500 GHz, 39.900 GHz
Occupied Bandwidth	See section 9.6
MIMO Information (# of Transmit and Receive antenna ports)	8 x 8
Equipment Type	Proprietary upbanded and modified 802.11AC Radio
Antenna Type and Gain	The Titan 37 antenna consists of two 37-40 GHz patch array antennas (one each for horizontal and vertical polarization) with a focusing lens. Each of the eight conducted paths drives one 1x8 patch column. There are four paths per polarization. All beamforming is digital (no analog beamforming), and beamforming is only done in azimuth (elevation beam pattern is fixed). The following table provides maximum gain per polarization (4 paths beamformed) with a 60 degree lens over the operating frequency range.

Polarity	Frequency [GHz]	Maximum Array Gain (w/ Radome Loss) [dBi]
H	37.1	21.44
H	38.5	22.72
H	39.9	20.35
V	37.1	20.37
V	38.5	21.91
V	39.9	21.41

Variant Models:

The following variant models were not tested as part of this evaluation, but 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 Human RF Exposure

FCC §30.207 Radio frequency (RF) safety.

Licensees and manufacturers are subject to the radio frequency radiation exposure requirements specified in FCC 47 CFR Part 1.1307(b), 1.1310, 2.1091, and 2.1093 of this chapter, as appropriate. Applications for equipment authorization of mobile or portable devices operating under this section must contain a statement confirming compliance with these requirements. Technical information showing the basis for this statement must be submitted to the Commission upon request.

FCC §1.1310 Radiofrequency radiation exposure limits

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

Table 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)	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	842/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

5.1 Human RF Exposure Results

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 of 55.2 dBm from Intertek Report # 105391852BOX-001 was used.

FCC Limit for General Population/Uncontrolled Exposure at 37.1 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 = 55.2 dBm

Safe Distance, D_{cm} = 162.33 cm

6 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	09/13/2023	105391852BOX-001c	KPS	VFV	Original Issue