

Test Report

Prepared for: Smart Route

Model: Thunder 255

Description: 4 Channel Base Station with Tetra Modulation

FCC ID: 2BFHD-THUNDER255

To

FCC Part 1.1310

Date of Issue: June 13, 2024

On the behalf of the applicant:

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Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	6/10/2024	Greg Corbin	Original Document
2.0	9/6/2024	Greg Corbin	Updated limit on page 5 from controlled environment to uncontrolled environment

ANAB

Compliance Testing, LLC, has been accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to the joint ISO-ILAC-IAF Communiqué dated January 2009).

The tests results contained within this test report all fall within our scope of accreditation, unless noted below.

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FCC Site Reg. #349717

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Non-accredited tests contained in this report:

N/A

EUT Description

Model: Thunder 255

Description: 4 Channel Base Station with Tetra Modulation

Serial Number: 0001

Additional Information:

The EUT is a 4-channel dual transmitter base station using Tetra modulation.

The frequency range, modulation and emission designators are listed in Table 1.

Table 1 – Frequency Range, Modulation, emission designators

Frequency Range (MHz)	Modulation	Emission Designator
450 – 470	Tetra	22K0D7D 22K0D7E 22K0D7W

The frequency range is further divided into 3 Bands as listed in Table 2. The test frequencies for 1 – 4 carriers are listed in Table 2.

The minimum channel spacing for the carriers is 200 kHz.

Table 2 – Test Frequencies

Band	Frequency range	Band 5 Test Freq – TX1				Band 5 Test Freq – TX2			
		1 CH	2 CH	3 CH	4 CH	1 CH	2 CH	3 CH	4 CH
5	451.01250 to 452.98750	451.0125	451.0125	451.0125	451.6125	451.2125	451.4125	451.6125	451.8125
			451.2125	451.2125	451.8125		451.6125	451.8125	452.0125
				451.4125	452.0125			452.0125	452.2125
					452.2125				452.4125

Band	Frequency range	Band 6 Test Freq – TX1				Band 6 Test Freq – TX2			
		1 CH	2 CH	3 CH	4 CH	1 CH	2 CH	3 CH	4 CH
6	460.41250 to 462.58750	460.4125	460.4125	460.4125	460.4125	460.6125	460.8125	461.0125	461.2125
			460.6125	460.6125	460.6125		461.0125	461.2125	461.4125
				460.8125	460.8125			461.4125	461.6125
					461.0125				461.8125

Band	Frequency range	Band 6 Test Freq – TX1				Band 6 Test Freq – TX2			
		1 CH	2 CH	3 CH	4 CH	1 CH	2 CH	3 CH	4 CH
7	467.51250 to 469.98750	468.9875	468.9875	468.9875	468.9875	468.7875	468.5875	468.3875	468.1875
			468.7875	468.7875	468.7875		468.3875	468.1875	467.9875
				468.5875	468.5875			467.9875	467.7875
					468.3875				467.5875

The output power is carrier dependent and listed in Table 3 per channel.

The output power is limited by the # of carriers and is reduced by ~ 3 dB per each additional carrier.

Table 3 – Output Power per carrier

Number of carriers	Maximum Output Power (dBm)
1	46
2	42
3	36
4	34

No antenna has been selected for the EUT.

Any calculations involving antenna gain will be calculated using 0 dBi antenna gain.

EUT Operation during tests:

The EUT is powered by 120 VAC 60 Hz.

MPE Evaluation

The EUT is a mobile device used in an Uncontrolled Exposure environment.

Limits Uncontrolled Exposure 47 CFR 1.1310 Table 1, (B)

0.3-1.234 MHz:	Limit [mW/cm ²] = 100
1.34-30 MHz:	Limit [mW/cm ²] = (180/f ²)
30-300 MHz:	Limit [mW/cm ²] = 0.2
300-1500 MHz:	Limit [mW/cm ²] = f/1500
1500-100,000 MHz	Limit [mW/cm ²] = 1.0

Test Data

The Lowest frequency and highest output power was used for the worse case calculations for each band.

The output power used for the MPE calculation is the manufacturer rated power (46 dBm) +20 % as allowed per part 90.205(s).

The limit is calculated using the lowest frequency resulting in the worst-case limit.

$S = \frac{P * G}{4\pi r^2}$
Power Density (S) mw/cm ²

Test Frequency, MHz	450
Power, Conducted, mW (P)	47772.8
Antenna Gain Isotropic	0
Antenna Gain Numeric (G)	1
Antenna Type	unknown
Distance (R)	20 cm

Power Density (S) = 9.504 mw/cm ²
Limit = (from above table) = 0.3 mw/cm ²

The EUT Power Density is over the limit at 20 cm when used with the 0 dBi antenna so the minimum safe distance was calculated.

Minimum Safe Distance Evaluation

Test Frequency, MHz	450
Power, Conducted, mW (P)	47772.8
Antenna Gain Isotropic	0 dBi
Antenna Gain Numeric (G)	1
Antenna Type	unknown
Limit mw/cm ² (L)	0.3

$R = \sqrt{(PG/4\pi L)}$			
Distance (R) cm	Power mW (P)	Numeric Gain (G)	Limit (L)
112.6	47772.8	1	0.3

The minimum safe distance with the 0 dBi antenna is 112.6 cm.

END OF TEST REPORT