Radio Frequency Exposure Evaluation Report

For:

FreeFall 5G, Inc.

Model Name:

FF5GAAS001BC

Product Description:

FreeStar5G Advanced Antenna System

FCC ID: 2AY36-FF5GAAS001BC

Per:

CFR Part Part1 (1.1307 &1.1310), Part 2 (2.1091),
FCC KDB 447498 D01 General RF Exposure Guidance v06

Report number: EMC_FREEF-002-21001_FCC_MPE_Rev2

DATE: 2021-09-09

***CETECOM* Inc.**
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1 Assessment

This RF Exposure evaluation report provides evidence for compliance of the below identified device with the RF Exposure limits for mobile devices as defined in FCC CFR Part 1 (1.1307 &1.1310), Part 2 (2.1091) under worst case conditions (measured or rated RF output power, antenna gain, distance towards human body, multiple transmitter information as presented by the applicant).
In addition, maximum antenna gain or minimum distance towards the human body is calculated respectively, where relevant.

The device meets the limits as stipulated by the above given FCC rule parts based on available specifications for worst case conditions at 38cm distance to the body.

Company	Description	Model #
FreeFall 5G, Inc.	FreeStar5G Advanced Antenna System	FF5GAAS001BC

Report reviewed by: TCB Evaluator

Date	Section	Name	Signature
2021-09-09	Compliance	Kevin Wang (Lab Manager)	kevin.wang@cetecom.com Digitally signed by: kevin.wang@cetecom.com DN: CN = kevin.wang@cetecom.com Date: 2021.09.09 17:28:39 -07'00'

Responsible for the Report:

Date	Section	Name	Signature
2021-09-09	Compliance	Yuchan Lu (EMC Engineer)	Yuchan Lu Digitally signed by: Yuchan Lu DN: CN = Yuchan Lu email = Yuchan.Lu@cetecom.com C = US O = CETECOM Inc. OU = EMC Date: 2021.09.09 17:56:06 -07'00'

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Street Address:	411 Dixon Landing Road
City/Zip Code	Milpitas, CA 95035
Country	USA
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
Lab Manager:	Kevin Wang
Responsible Project Leader:	Akanksha Baskaran

2.2 Identification of the Client / Manufacturer

Client's Name:	FreeFall 5G, Inc.
Street Address:	3525 E. Fort Lowell Road
City/Zip Code	Tucson, Arizona / 85716
Country	United States

Identification of the Manufacturer

Manufacturer's Name:	ED2 Corporation
Manufacturers Address:	7636 N. Oracle Road
City/Zip Code	Tucson, Arizona / 85704
Country	United States

3 Equipment under Assessment

Model No:	FF5GAAS001BC
HW Version :	Version 1.0
SW Version :	Version 1.0
Regulatory Band:	5G n261 band: 27.5 - 28.35 GHz
Antenna Type:	Maximum Gain: 18 dBi
Maximum EIRP Density:	Average measurement: 41.14 dBm/100MHz
Power Supply/ Rated Operating Voltage Range:	Vnom: 120 VAC
Operating Temperature Range:	-40ºC to 55 ºC
Sample Revision:	☐Prototype Unit; ■Production Unit; ☐Pre-Production

4 RF Exposure Limits and FCC and IC Basic Rules

For the specific described radio apparatus the following basic limits and rules apply for both, FCC and IC where not indicated differently.

4.1 Power Density Limits acc. to FCC 1.1310(e) / RSS-102 i5, cl. 4:

FCC

Frequency Range (MHz)	Power density (mW/cm²)	Averaging time (minutes)
300 – 1500	f (MHz) /1500	30
1500 – 100000	1.0	30

IC

300 – 6000	0.02619 x f (MHz) $^{0.6834}$	6

4.2 Routine Environmental Evaluation Categorical Exclusion Limits acc. to FCC 2.1091(c) / RSS-102, cl. 2.5 (rounded to 1 decimal point):

FCC
operating frequency < 1.5GHz: excluded if ERP < 1.5W / 31.8dBm (EIRP: 33.9 dBm);
operating frequency > 1.5GHz: excluded if ERP < 3.0W / 34.8dBm (EIRP: 36.9 dBm);

IC
300MHz < = operating frequency < 6 GHz: excluded if EIRP < 0.0131 x f (MHz) $^{0.6834}$ W

4.3 RF Exposure Estimation (MPE Estimation)

Having available the source based average output power and peak antenna gain or the ERP/EIRP of the specified device and for a known minimum distance of its radiating structures from the body of persons according to its use cases (at least 20cm) the power density at that distance can be estimated by the following formula for plane-wave equivalent conditions (far-field conditions), when ground reflection is neglected.

$$S = \frac{PG}{4\pi R^2}$$

where: S = power density (mW/cm² or W/m²)
P = power input to the antenna (mW or W)
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 (cm or m)

5 Evaluations

5.1 Analysis of RF Exposure for stand-alone transmission

- Evaluations are based on worst case power density limits for FCC.
- Calculations are made for 38cm.
- Evaluations are based on EIRP measured.
- Only one single antenna is evaluated.

Radio	Freq [MHz]	EIRP [dBm]	EIRP [W]	FCC LImit [W/m2]	Actual [W/m2]²
5G n261	27500	41.14	13	10	7.16

5.2 Analysis of RF Exposure for simultaneous transmission

- Evaluations are based on worst case power density limits for FCC.
- Calculations are made for 38cm.
- Evaluations are based on EIRP measured.
- Adjacent Antenna (on the same blade or on the adjacent blade) contribution are added.

Radio	Freq [MHz]	EIRP [dBm]	EIRP [W]	FCC LImit [W/m2]	Actual [W/m2]²
5G n261	27500	42.33	17.10	10	9.42

Note： Based on the Antenna Gain Plot, the contribution from an Adjacent Antenna will be 41.89-12 = 29.14dBm, which is 0.82W. And conservatively accounting for 5 Adjacent Antenna, then the EIRP will be 13+5*0.82 = 17.1W.

5.3 Conclusion:

The equipment is passing RF exposure requirements for 38cm distance.

6 Revision History

Date	Report Name	Changes to report	Report prepared by
2021-07-01	EMC_FREEF-002-21001_FCC_MPE	Initial Version	Yuchan Lu
2021-08-23	EMC_FREEF-002-21001_FCC_MPE_Rev1	Updated Section 5	Yuchan Lu
2021-09-09	EMC_FREEF-002-21001_FCC_MPE_Rev2	Updated Section 5 with 38 cm distance	Yuchan Lu

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