



RF Exposure Evaluation Report

For:
Faraday Future

Model:
FF MMU 5G x3

Product Description:
Provide Cellular, Wifi and BLE connectivity to FF vehicle for internet access

FCC ID: 2BBLDTI2642FF91

CONTAINS FCC ID: 2BBLDNF3219FF91
XMR2022AG550QNA

Per:
CFR Part Part1 (1.1307 & 1.1310), Part 2 (2.1093),
FCC KDB 447498 D04 Interim General RF Exposure Guidance v01
ISED RSS-102 Issue 5

Report number: EMC_FARAD_001_23001_FCC_RF_Exposure_Rev1

DATE: 2023-08-17



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1 Assessment

This RF Exposure evaluation report provides evidence for compliance of the equipment (as identified in section 3 of this test report) with the RF Exposure limits for mobile devices as defined in FCC CFR Part 1.1307, Part 2 (2.1093) and ISED standard RSS-102 issue 5 under worst case conditions (measured or rated RF output power including tune-up tolerance, antenna gain, the distance towards the 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 stipulated by the above given FCC and ISED rule parts based on available specifications for worst-case conditions at a separation distance greater than 20cm to the body.

Company	Description	Model No.
Faraday Future	Provide Cellular, Wi-Fi and BLE connectivity to FF vehicle for internet access	FF MMU 5G x3

Responsible for Testing Laboratory:

2023-08-17	Compliance	Arndt Stoecker (Director of Regulatory Services)	
Date	Section	Name	Signature

Responsible for the Report:

2023-08-17	Compliance	Art Thammanavarat (Senior EMC Engineer)	
Date	Section	Name	Signature

The test results of this test report relate exclusively to the test item specified in Section 3.

CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM Inc. USA.

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the EMC 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
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EMC Lab Manager:	Arndt Stoecker
Responsible Project Leader:	Phillip Quintal

2.2 Identification of the Client

Client Firm/Name:	Faraday Future
Street Address:	2895 Zanker Road
City/Zip Code	San Jose/CA 95134
Country	USA

2.3 Identification of the Manufacturer

Manufacturer's Name:	Same as Client
Manufacturers Address:	
City/Zip Code	
Country	

3 Equipment under Assessment

Product Description:	Provide Cellular, Wifi and BLE connectivity to FF vehicle for internet access
Model Name :	FF MMU
HW Version :	B2
SW Version :	1.0.9
Contains FCC ID :	CONTAINS FCC ID: 2BBLDNF3219FF91 CONTAINS FCC ID: XMR2022AG550QNA
Bands/Modes Supported	Cellular Modules Model Name : Quectel Model Number : EG18-NA FCC : XMR202002EG18NA IC : 10224A-20202EG18NA Wireless Technologies LTE FDD/TDD Bands: 2,4,5,7,12,13,14,17,25,26,41,66, 71 5G NR Bands NSA: n2,n5,n25,n41,n66,n71,n77,n78
	Wi-Fi Modules Model Name : nFore Model Number : NF3219 FCC : 2BBLDNF3219FF1 Wireless Technologies Wi-Fi 2.4GHz Wi-Fi 5GHz
	Bluetooth Modules Model Name : TI CC264R Wireless Technologies Bluetooth LE
Frequency Range	Frequency Range : Wi-Fi 2.4GHz: 2400 – 2480 MHz Wi-Fi 5GHz: 5150 – 5850 MHz LTE Band 2: 1850 – 1910 MHz LTE Band 4: 1710 – 1755 MHz LTE Band 5: 824 – 849 MHz LTE Band 12: 699 – 716 MHz LTE Band 13: 777 – 787 MHz LTE Band 14: 788 – 798 MHz LTE Band 17: 704 – 716 MHz LTE Band 25: 1850– 1915 MHz LTE Band 26: 814 – 849 MHz LTE Band 41: 2496 – 2690 MHz LTE Band 66: 1710 – 1780 MHz LTE Band 71: 663 – 698 MHz
Power Supply/ Rated Operating Voltage Range	+8 ~ +18V
Operating Temperature Range	Low : -40°C Norm45°C High +60°C
Sample Revision	☒ Production ☐ Pre-Production
EUT Dimensions	210mm x 160mm x 52.8mm

Weight	1600g
EUT Diameter	☒ < 60 cm ☐ Other _____
Max. Conducted Output Power:	See Table P1
Max. declared antenna gain	See Table A1

Note: The information of the EUT specifications in the table above is provided by the client except the specified (Measured or calculated) output power.

Table: P1 (Max. Conducted Output Power)

Radio/Band	UL Frequency (MHz)	RF Output Measured Power (dBm)
LTE 2 (25)	1880.0	23.10
LTE 4 (66)	1732.5	22.80
LTE 5 (26)	836.6	23.50
LTE 7	2535.0	23.40
LTE 12 (85)	707.5	23.00
LTE 13	782.0	22.60
LTE 14	793.0	23.20
LTE 17	710.0	23.00
LTE 25	1882.5	23.10
LTE 26	831.5	23.40
LTE 41	2593.0	23.30
LTE 66	1745.0	22.70
LTE 71	680.5	22.90
13 + n2 (NSA)	782.0	22.60
13 + n66 (NSA)	782.0	22.60
66 + n2 (NSA)	1745.0	22.70
66 + n5 (NSA)	1745.0	22.70
2 + n5 (NSA)	1880.0	23.10
WIFI 2.4GHz	2437.0	15.26
WIFI 5GHz UNII1	5200.0	18.22
WIFI 5GHz UNII3	5875.0	18.16
BLE	2440.0	0.88

Table A1: (Max. declared antenna gain)

Radio/Band	UL Frequency (MHz)	Antenna Gain Main/DIV
LTE 2 (25)	1880.0	2.07
LTE 4 (66)	1732.5	0.71
LTE 5 (26)	836.6	1.06
LTE 7	2535.0	2.82
LTE 12 (85)	707.5	-0.97
LTE 13	782.0	0.32
LTE 14	793.0	0.32
LTE 17	710.0	-0.39
LTE 25	1882.5	2.07
LTE 26	831.5	1.06
LTE 41	2593.0	2.31
LTE 66	1745.0	0.71
LTE 71	680.5	-0.91
13 + n2 (NSA)	782.0	0.32
13 + n66 (NSA)	782.0	0.32
66 + n2 (NSA)	1745.0	0.71
66 + n5 (NSA)	1745.0	0.71
2 + n5 (NSA)	1880.0	2.07
WIFI 2.4GHz	2437.0	1.13
WIFI 5GHz UNII1	5200.0	3.83
WIFI 5GHz UNII3	5875.0	1.95
BLE	2440.0	1.57

4 RF Exposure Limits and FCC and ISED Basic Rules

4.1 FCC

4.1.1 § 2.1093(c)(1)

Evaluation of compliance with the exposure limits in § 1.1310 of this chapter, and preparation of an EA if the limits are exceeded, is necessary for mobile devices with single RF sources having either more than an available maximum time-averaged power of 1 mW or more than the ERP listed in Table 1 to § 1.1307(b)(3)(i)(C), whichever is greater. For mobile devices not exempt by § 1.1307(b)(3)(i)(C) at distances from 20 centimeters to 40 centimeters and frequencies from 0.3 GHz to 6 GHz, evaluation of compliance with the exposure limits in § 1.1310 of this chapter is necessary if the ERP of the device is greater than ERP_{20cm} in the formula below. If the ERP of a single RF source at distances from 20 centimeters to 40 centimeters and frequencies from 0.3 GHz to 6 GHz is not easily obtained, then the available maximum time-averaged power may be used (i.e., without consideration of ERP) in comparison with the following formula only if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

$$P_{th}(\text{mW}) = ERP_{20\text{ cm}}(\text{mW}) = \begin{cases} 2040f & 0.3\text{ GHz} \leq f < 1.5\text{ GHz} \\ 3060 & 1.5\text{ GHz} \leq f \leq 6\text{ GHz} \end{cases}$$

4.1.2 § 2.1093(c)(2)

For multiple mobile or portable RF sources within a device operating in the same time averaging period, routine environmental evaluation is required if the formula in § 1.1307(b)(3)(ii)(B) of this chapter is applied to determine the exemption ratio and the result is greater than 1.

4.1.3 § 1.1307(b)(3)(ii)(B)

in the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation.

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure\ Limit_k} \leq 1$$

4.2 ISED RSS 102

4.1.4 Clause 2.5.2 Exemption Limits for Routine Evaluation – RF Exposure Evaluation

at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;

5 Evaluations

5.1 FCC RF Exposure (Standalone)

Radio	Tech-Band	Freq-Low _[GHz]	Pwr _[dBm]	Power _[W]	Ant-G _[dBi]	ERP _[mW]	Threshold ERP _[W]	ERP < Threshold ERP _[W]	FCC 2.1093(c)(1) Pth _[mW] = ERP _{20cm}
Cellular	LTE 2	1.8550	23.10	0.204	2.07	200.45	0.77	Yes	3060.00
	LTE 4	1.7150	22.80	0.191	0.71	136.77	0.77	Yes	3060.00
	LTE 5	0.8290	23.50	0.224	1.06	174.18	0.42	Yes	1691.16
	LTE 12	0.7040	23.00	0.200	-0.97	97.27	0.36	Yes	1436.16
	LTE 13	0.7820	22.60	0.182	0.32	119.40	0.40	Yes	1595.28
	LTE 14	0.7795	23.20	0.209	0.32	137.09	0.40	Yes	1590.18
	LTE 7	2.5050	23.40	0.219	2.82	255.27	0.77	Yes	3060.00
	LTE 17	0.7090	23.00	0.200	-0.39	111.17	0.36	Yes	1446.36
	LTE 25	1.8550	23.10	0.204	2.07	200.45	0.77	Yes	3060.00
	LTE 26	0.8190	23.40	0.219	1.06	170.22	0.42	Yes	1670.76
	LTE 41	2.5010	23.30	0.214	2.31	221.82	0.77	Yes	3060.00
	LTE 66	1.7150	22.70	0.186	0.71	133.66	0.77	Yes	3060.00
	LTE 71	0.6680	22.90	0.195	-0.91	96.38	0.34	Yes	1362.72
	13 + n2 (NSA)	0.7820	22.60	0.182	0.32	119.40	0.40	Yes	1595.28
	13 + n66 (NSA)	0.7820	22.60	0.182	0.32	119.40	0.40	Yes	1595.28
	66 + n2 (NSA)	1.7150	22.70	0.186	0.71	133.66	0.77	Yes	3060.00
	66 + n5 (NSA)	1.7150	22.70	0.186	0.71	133.66	0.77	Yes	3060.00
	2 + n5 (NSA)	1.8550	23.10	0.204	2.07	200.45	0.77	Yes	3060.00
Radio	Tech-Band	Freq-Low _[GHz]	Pwr _[dBm]	Power _[W]	Ant-G _[dBi]	ERP _[mW]	Threshold ERP _[W]	ERP < Threshold ERP _[W]	FCC 2.1093(c)(1) Pth _[mW] = ERP _{20cm}
BT	LE	2.4020	0.88	0.0012	1.57	1.07	0.77	Yes	3060.00
WLAN	802.11g	2.4120	15.26	0.0336	1.13	26.55	0.77	Yes	3060.00
	802.11.a	5.1800	18.22	0.0664	3.83	97.72	0.77	Yes	3060.00
	802.11.a	5.7450	18.16	0.0655	1.95	62.52	0.77	Yes	3060.00

5.2 ISED RF Exposure (Standalone)

									RF Exposure	
									RSS-102 2.5.2 D>20 cm (300 ≤ Freq < 6000 MHz)	
Radio	Tech-Band	Freq-Low [MHz]	Pwr _[dBm]	Power _[W]	Ant-G [dBi]	Ant-G [lin]	EIRP _[W]	EIRP _[mW]	Exemption limit for Routine Evaluation	Exemption (Y/N)
Cellular	LTE 2	1855.00	23.10	0.20	2.07	1.61	0.33	328.85	2.24	Yes
	LTE 4	1715.00	22.80	0.19	0.71	1.18	0.22	224.39	2.13	Yes
	LTE 5	829.00	23.50	0.22	1.06	1.28	0.29	285.76	1.29	Yes
	LTE 12	704.00	23.00	0.20	-0.97	0.80	0.16	159.59	1.16	Yes
	LTE 13	782.00	22.60	0.18	0.32	1.08	0.20	195.88	1.24	Yes
	LTE 14	779.50	23.20	0.21	0.32	1.08	0.22	224.91	1.2	Yes
	LTE 7	2505.00	23.40	0.22	2.82	1.91	0.42	418.79	2.75	Yes
	LTE 25	1855.00	23.10	0.20	2.07	1.61	0.33	328.85	2.24	Yes
	LTE 26	819.00	23.40	0.22	1.06	1.28	0.28	279.25	1.28	Yes
	LTE 41	2501.00	23.30	0.21	2.31	1.70	0.36	363.92	2.75	Yes
	LTE 66	1715.00	22.70	0.19	0.71	1.18	0.22	219.28	2.13	Yes
	LTE 71	668.00	22.90	0.19	-0.91	0.81	0.16	158.12	1.12	Yes
	13 + n2 (NSA)	782.00	22.60	0.18	0.32	1.08	0.20	195.88	1.24	Yes
	13 + n66 (NSA)	782.00	22.60	0.18	0.32	1.08	0.20	195.88	1.24	Yes
	66 + n2 (NSA)	1715.00	22.70	0.19	0.71	1.18	0.22	219.28	2.13	Yes
	66 + n5 (NSA)	1715.00	22.70	0.19	0.71	1.18	0.22	219.28	2.13	Yes
	2 + n5 (NSA)	1855.00	23.10	0.20	2.07	1.61	0.33	328.85	2.24	Yes
Radio	Tech-Band	Freq-Low [MHz]	Pwr _[dBm]	Power _[W]	Ant-G [dBi]	Ant-G [lin]	EIRP _[W]	EIRP _[mW]	Exemption limit for Routine Evaluation	Exemption (Y/N)
BT	LE	2402.00	0.88	0.00	1.57	1.44	0.00	1.76	2.68	Yes
WLAN	802.11g	2412.00	15.26	0.03	1.13	1.30	0.04	43.55	2.68	Yes
	802.11.a	5180.00	18.22	0.07	3.83	2.42	0.16	160.32	4.53	Yes
	802.11.a	5745.00	18.16	0.07	1.95	1.57	0.10	102.57	4.86	Yes

5.3 Multiple RF sources

The worst case of simultaneous transmission are

1. LTE Band 71 + BLE + WLAN 802.11a (5 GHz):
 $(195/1362.72) + (1.2/3060) + (66.4/3060) = 0.175 \leq 1$

The sum of the fractional contributions to the applicable thresholds is less than or equal to 1, hence the multiple RF sources are exempt

6 Revision History

Date	Report Name	Changes to report	Prepared by
8/16/2023	EMC_FARAD_001_23001_FCC_RF_Exposure	Initial Version	Art Thammanavarat
8/17/2023	EMC_FARAD_001_23001_FCC_RF_Exposure_Rev1	Report Revised 1. Sections 3: Updated power table. 2. Sections 5.1, 5.2&5.3: Updated power.	Art Thammanavarat

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