



Radio Frequency Exposure Evaluation Report

FOR:
Pratt & Whitney

Model Number:
HMU200-1(4G)

Product Description:
Collection of aircraft engine and airframe data in flight and wireless transmission of collected data on ground

FCC ID: 2AQWD-HMU200-4G
IC ID: 25562-HMU2004G

Per:
CFR Part Part1 (1.1307 & 1.1310), Part 2 (2.1091),
FCC KDB 447498 D01 General RF Exposure Guidance v06
ISED RSS-102 Issue 5

Report number: EMC_PRATT_008_19001_FCC_ISED_MPE

DATE: 2021-04-05



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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) and IC standard RSS-102 issue 5 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 and IC rule parts based on available specifications for worst case conditions at 20cm distance to the body.

Company	Description	Model #
Pratt & Whitney	Collection of aircraft engine and airframe data in flight and wireless transmission of collected data on ground	HMU200-1(4G)

Report reviewed by: TCB Evaluator

2021-04-05 Compliance Kevin Wang
(Lab Manager)

Date	Section	Name	Signature
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Responsible for the Report:

2021-04-05 Compliance Yuchan Lu
(Test Engineer)

Date	Section	Name	Signature
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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:	Cindy Li
Responsible Project Leader:	Cathy Palacios

2.2 Identification of the Client / Manufacturer

Client's Name:	Pratt & Whitney
Street Address:	400 Main Street, MS 168-15
City/Zip Code	East Hartford, CT 06118
Country	USA

Identification of the Manufacturer

Manufacturer's Name:	Collins Aerospace & Setrix
Manufacturers Address:	400 Main Street, MS 168-15
City/Zip Code	East Hartford, CT 06118
Country	USA

3 Equipment under Assessment

Marketing name:	eFAST
HW Version :	4
SW Version :	1.24
Firmware Version Identification Number (FVIN):	N/A
Hardware Version Identification Number (HVIN):	HMU2004G
Product Marketing Name (PMN):	eFAST
Regulatory Band:	❖ <u>Cellular Module:</u> ▪ GSM 850: 824.2 ~ 848.8 MHz ▪ GSM 1900: 1850.2 ~ 1909.8 MHz ▪ WCDMA/UMTS FDD BAND II: 1852.4 ~ 1907.6 MHz ▪ WCDMA/UMTS FDD BAND IV: 1712.4 ~ 1752.6 MHz ▪ WCDMA/UMTS FDD BAND V: 826.4 ~ 846.6 MHz ▪ LTE BAND 2: 1857.5 ~ 1902.5 MHz ▪ LTE BAND 4: 1717.5 ~ 1747.5 MHz ▪ LTE BAND 5: 824.7 ~ 848.3 MHz ▪ LTE BAND 7: 2510 ~ 2560 MHz ▪ LTE BAND 12: 699.7 ~ 715.3 MHz ❖ <u>WLAN:</u> ▪ Nominal band: 2400 MHz – 2483.5 MHz; ▪ Center to center: 2412 MHz (ch 1) – 2462 MHz (ch 11), 11 channels
Integrated Module Info:	❖ <u>Cellular Module:</u> ▪ Module name: Gemalto ▪ Model number: PLS62-W ▪ FCC/IC ID: QIPPLS62-W / 7830A-PLS62W ❖ <u>WLAN:</u> ▪ Module name: Ti-Wi BLE ▪ FCC/IC ID: TFB-TIWI1-01 / 5969A-TIWI101
Antenna Type:	❖ <u>Cellular:</u> ▪ Antenna maximum gain: ▪ GSM 850: 1.5 dBi ▪ GSM 1900: 3.0 dBi ▪ WCDMA II: 3.0 dBi

	▪ WCDMA IV: 3.0 dBi ▪ WCDMA V: 1.5 dBi ▪ LTE Band 2: 3.0 dBi ▪ LTE Band 4: 3.0 dBi ▪ LTE Band 5: 1.5 dBi ▪ LTE Band 7: 4.5 dBi ▪ LTE Band 12: 1.5 dBi ▪ Cable loss: ○ LTE B12: 0.94 dB ○ GSM 850 / UMTS V / LTE B5: 1.06 dB ○ LTE B4 / UMTS IV: 1.62 dB ○ GSM 1900 / UMTS II / LTE B2: 1.67 dB ○ LTE B7: 1.90 dB ❖ <u>WLAN:</u> ▪ Antenna gain: 3 dBi ▪ Cable loss: 1.27 dB
Maximum Conducted Output Power:	❖ <u>Cellular:</u> From modular grant [Watts]: ▪ GSM 850 EIRP: 2.35 ▪ GSM1900 EIRP: 1.035 ▪ WCDMA Band II: 0.170 ▪ WCDMA Band IV: 0.181 ▪ WCDMA Band V: 0.169 ▪ LTE Band 2: 0.164 ▪ LTE Band 4: 0.171 ▪ LTE Band 5: 0.203 ▪ LTE Band 7: 0.134 ▪ LTE Band 12: 0.167 ❖ <u>WLAN:</u> From modular grant [Watts]: 0.093
Power Supply/ Rated Operating Voltage Range:	Low 23.8VDC, Nominal 28VDC, High 32.2VDC
Operating Temperature Range:	Low -30° C, Nominal 25° C, High 70° C
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/cm ²)	Averaging time (minutes)
300 – 1500	f (MHz) /1500	30
1500 – 100000	1.0	30

IC

300 – 6000	$0.02619 \times f \text{ (MHz)}^{0.6834}$	6
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4.2 Routine Environmental Evaluation Categorical Exclusion Limits acc. to FCC 2.109(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 < $0.0131 \times f \text{ (MHz)}^{0.6834} \text{ W}$

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 simultaneous transmission

- Evaluations are based on worst case power density limits for Canada.
- Calculations are made for 20cm.
- Evaluations are based on ERP/EIRP measured or calculated from known gain and conducted output power.
- Cellular can transmit simultaneously with WLAN.

Radio	freq [MHz]	Max Conducted power [W]	Conducted Power + Tune up	Antenna Gain + Cable Loss [dBi]	Gain [lin]	EIRP [W]	IC Limit [W/m2]	FCC Limit [W/m2]	Actual [W/m2] ²	How much of limit is used up
GSM 850	824	2.35	3.162	0.44	1.11	0.437 ¹	2.576	5.493	0.870	33.78%
GSM 1900	1850	1.035	1.585	1.33	1.36	0.269 ¹	4.476	10.000	0.535	11.96%
WCDMA II	1850	0.17	0.316	1.33	1.36	0.429	4.476	10.000	0.854	19.08%
WCDMA IV	1710	0.181	0.316	1.38	1.37	0.434	4.242	10.000	0.864	20.36%
WCDMA V	824	0.169	0.316	0.44	1.11	0.350	2.576	5.493	0.696	27.01%
LTE 2	1850	0.164	0.316	1.33	1.36	0.429	4.476	10.000	0.854	19.08%
LTE 4	1710	0.171	0.316	1.38	1.37	0.434	4.242	10.000	0.864	20.36%
LTE 5	824	0.203	0.316	0.44	1.11	0.350	2.576	5.493	0.696	27.01%
LTE 7	2500	0.134	0.316	2.6	1.82	0.575	5.499	10.000	1.144	20.80%
LTE 12	699	0.167	0.316	0.56	1.14	0.359	2.302	4.660	0.715	31.07%
WLAN	2400	0.093	0.147	1.73	1.49	0.219	5.348	10.000	0.436	8.14%

Note1: EIRP of GSM850 and GSM1900 are corrected for worst case DC 12.5%

Note2: The calculation is based on the distance of 20cm

5.2 Conclusion:

The worst-case simultaneous transmission is GSM 850 simultaneous with WLAN, which is using 41.92 of a limit of 100%. The equipment is passing RF exposure requirements for 20cm distance.

6 Revision History

Date	Report Name	Changes to report	Report prepared by
2021-04-05	EMC_PRATT_008_19001_FCC_ISSED_MPE	Initial Release	Yuchan Lu

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