



Radio Frequency Exposure Evaluation Report

FOR:

Pratt & Whitney, division of UTC

Model Number:

HMU200-1

Product Description:

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

FCC ID: 2AQWD-HMU200-3G

IC ID: 25562-HMU2003G

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_006_19001_FCC_ISED_MPE-R1

DATE: 2020-08-28



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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 30 cm distance to the body.

Company	Description	Model #
Pratt & Whitney, division of UTC	Collection of aircraft engine and airframe data in flight and wireless transmission of collected data on ground	HMU200-1

Report reviewed by: TCB Evaluator

2020-08-28 Compliance Cindy Li
(Lab Manager)

Date	Section	Name	Signature
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Responsible for the Report:

2020-08-28 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
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Lab Manager:	Cindy Li
Responsible Project Leader:	Cathy Palacios

2.2 Identification of the Client / Manufacturer

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

2.3 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

Model number:	HMU200-1
HW Version :	3
SW Version :	1.24
Firmware Version Identification Number (FVIN):	1.24
Hardware Version Identification Number (HVIN):	HMU200-1
Product Marketing Name (PMN):	eFAST
Regulatory Band:	<ul style="list-style-type: none"> ❖ <u>Cellular Module:</u> <ul style="list-style-type: none"> ▪ 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 V: 826.4 ~ 846.6 MHz ❖ <u>WLAN:</u> <ul style="list-style-type: none"> ▪ Nominal band: 2400 MHz – 2483.5 MHz; ▪ Center to center: 2412 MHz (ch 1) – 2462 MHz (ch 11), 11 channels
Integrated Module Info:	<ul style="list-style-type: none"> ❖ <u>Cellular Module:</u> <ul style="list-style-type: none"> ▪ Module name: PH8-P ▪ Model number: PH8-P ▪ FCC/IC ID: QIPPH8-P / 7830A-PH8P ❖ <u>WLAN:</u> <ul style="list-style-type: none"> ▪ Module name: Ti-Wi BLE ▪ FCC/IC ID: TFB-TIWI1-01 / 5969A-TIWI101
Antenna Type:	<ul style="list-style-type: none"> ❖ <u>Cellular:</u> <ul style="list-style-type: none"> ▪ Antenna maximum gain: ▪ GSM 850: 3.0 dBi ▪ GSM 1900: 3.0 dBi ▪ WCDMA II: 3.0 dBi ▪ WCDMA V: 3.0 dBi ▪ Cable loss 10ft <ul style="list-style-type: none"> ○ 1.22 dB at 1000MHz ○ 1.58 dB at 1600MHz ○ 1.86 dB at 2400MHz

	<ul style="list-style-type: none"> ❖ WLAN: <ul style="list-style-type: none"> ▪ Antenna gain: 3 dBi ▪ Cable loss 10ft: 1.07 dB
Maximum Peak Conducted Output Power:	<ul style="list-style-type: none"> ❖ Cellular: From modular grant [Watts]: <ul style="list-style-type: none"> ▪ GSM 850: 2.588 ▪ GSM1900: 1.318 ▪ WCDMA Band II: 1.38 ▪ WCDMA Band V: 1.122 ❖ WLAN: 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:	<input type="checkbox"/> Prototype Unit; <input checked="" type="checkbox"/> Production Unit; <input type="checkbox"/> 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 x f (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 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 simultaneous transmission

- Evaluations are based on worst case power density limits for Canada.
- Calculations are made for 30 cm.
- 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 Peak Conducted power [W]	Conducted Power + Tune up	Antenna Gain +Cable Loss [dBi]	Gain [lin]	EIRP [W]	IC Limit [W/m ²]	FCC Limit [W/m ²]	Actual [W/m ²] ²	How much of limit is used up
GSM 850	824	2.588	3.162	1.94	1.56	2.471	2.576	5.493	2.185	84.84%
GSM 1900	1850	1.318	1.585	1.33	1.36	1.076	4.476	10.000	0.952	21.26%
WCDMA II	1850	1.38	0.316	1.33	1.36	0.430	4.476	10.000	0.380	8.48%
WCDMA V	824	1.122	0.316	1.94	1.56	0.494	2.576	5.493	0.437	16.97%
WLAN	2400	0.093	0.147	1.93	1.56	0.156	5.348	10.000	0.138	2.58%

**Note1: EIRP of GSM850 and GSM1900 are corrected for worst case DC 50 %
The calculation is based on the distance of 30 cm**

5.2 Conclusion:

The worst-case simultaneous transmission is GSM 850 simultaneous with WLAN, which is using 87.42 of a limit of 100%. The equipment is passing RF exposure requirements for 30 cm distance.

6 Revision History

Date	Report Name	Changes to report	Report prepared by
2020-02-10	EMC_PRATT_006_19001_FCC_IS ED_MPE	Initial Release	Yuchan Lu
2020-08-28	EMC_PRATT_006_19001_FCC_IS ED_MPE-R1	Updated for 10 ft cables and 50% DC for GSM for Section 5.1. Updated HVIN / FVIN Section 3	Yuchan Lu