



Radio Frequency Exposure Evaluation Report

FOR:

Pratt & Whitney, division of RTX

Model Name:

HMU200-2

Product Description:

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

FCC ID: 2AQWD-HMU200-2

IC ID: 25562-HMU2002

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-009-21001_FCC_ISED_MPE_Rev1

DATE: 2022-03-16



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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 Name
Pratt & Whitney, division of RTX	Collection of aircraft engine and airframe data in flight and wireless transmission of collected data on ground	HMU200-2

Report reviewed by: TCB Evaluator

2022-03-16	Compliance	Kevin Wang (Lab Manager)	Kevin Wang wang@cetecom.com Digitally signed by: Kevin Wang CN: Kevin Wang Date: 2022.03.16 17:05:37 -07'00'
Date	Section	Name	Signature

Responsible for the Report:

2022-03-16	Compliance	Cheng Song (EMC Engineer)	Cheng Song song@cetecom.com Digitally signed by: Cheng Song CN: Cheng Song Date: 2022.03.16 13:29:58 -07'00'
Date	Section	Name	Signature

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
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Country	USA
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Lab Manager:	Kevin Wang
Responsible Project Leader:	Cathy Palacios

2.2 Identification of the Client / Manufacturer

Client's Name:	Pratt & Whitney, division of RTX
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

Model Name:	HMU200-2
Marketing Name:	eFAST
HW Version :	5
SW Version :	1.28.6
FCC-ID :	2AQWD-HMU200-2
IC-ID:	25562-HMU2002
FWIN:	N/A
HVIN:	HMU200-2
PMN:	eFAST
Regulatory Band:	Cellular Module: • LTE Band 2: 1850 – 1910 MHz • LTE Band 4: 1710 – 1755 MHz • LTE Band 5: 824 – 849 MHz • LTE Band 7: 2500 – 2570 MHz • LTE Band 12: 699 – 716 MHz • LTE Band 13: 777 – 787 MHz • LTE Band 26: 814 – 849 MHz • LTE Band 41: 2496 – 2690 MHz • LTE Band 66: 1710 – 1780 MHz • UMTS Band II: 1850 – 1910 MHz • UMTS Band IV: 1710 – 1732.5 MHz • UMTS Band V: 824 – 849 MHz • GSM850: 824.2 – 848.8 MHz • GSM1900: 1850.2 – 1909.8 MHz WLAN: • Nominal band: 2400 MHz – 2483.5 MHz; • Center to center: 2412 MHz (ch 1) – 2462 MHz (ch 11), 11 channels
Integrated Module Info:	Cellular Module: • Module: THALES PLS83-W • FCC ID: QIPPLS83-W; IC ID: 7830A-PLS83W; WLAN: • Manufacture: Silicon Labs • Module name/number: WFM200S022XNN3 • FCC ID: QQQWFM200 • IC ID: 5123A-WFM200
Antenna Info:	Cellular: • Antenna Type: Multiband Omnidirectional • Antenna gain(dBi): - o WCDMA Band II: 3 - o WCDMA Band IV: 3 - o WCDMA Band V: 1.5 - o LTE Band 2: 3 - o LTE Band 4: 3 - o LTE Band 7: 4.5 - o LTE Band 12: 3 - o LTE Band 13: 1.5 - o LTE Band 26: 1.5

	- o LTE Band 41: 4.5 - o LTE Band 66: 3 - o GSM 850: 1.5 - o GSM 1900: 3 WLAN: • Antenna Type: 1/4 wave monopole • Antenna gain: 3 dBi
Maximum Conducted Output Power:	Cellular: From conducted test report [Watts]: • WCDMA Band II: 0.316 • WCDMA Band IV: 0.316 • WCDMA Band V: 0.316 • LTE Band 2: 0.316 • LTE Band 4: 0.316 • LTE Band 7: 0.316 • LTE Band 12: 0.316 • LTE Band 13: 0.316 • LTE Band 26: 0.316 • LTE Band 41: 0.316 • LTE Band 66: 0.316 • GSM 850: 3.2 • GSM 1900: 1.6 WLAN: From modular grant [Watts]: 0.044
Power Supply/ Rated Operating Voltage Range:	Vmin: 23.8 VDC/ Vnom: 28 VDC / Vmax: 32.2 VDC
Operating Temperature Range:	-30°C to 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 2.1091(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 < $0.0131 \times f \text{ (MHz)}^{0.6834}$ 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 and US.
- 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	MaxPower W conducted	MaxPower r convert to dBm	Ant Gain dbi	Ant Gain lin	EIRP W calculated	Max Duty Cycle	IC W/m2	FCC W/m2	Actual W/m2	How much of IC limit is used up	How much of FCC limit is used up
WCDMA II	1850	0.316	25.000	3	2.00	0.631	100.00%	4.476	10.000	1.255	28.04%	12.55%
WCDMA IV	1710	0.316	25.000	3	2.00	0.631	100.00%	4.242	10.000	1.255	29.59%	12.55%
WCDMA V	824	0.316	25.000	1.5	1.41	0.447	100.00%	2.576	5.493	0.889	34.49%	16.17%
LTE 2	1850	0.316	25.000	3	2.00	0.631	100.00%	4.476	10.000	1.255	28.04%	12.55%
LTE 4	1710	0.316	25.000	3	2.00	0.631	100.00%	4.242	10.000	1.255	29.59%	12.55%
LTE 7	2500	0.316	25.000	4.5	2.82	0.891	100.00%	5.499	10.000	1.773	32.24%	17.73%
LTE 12	699	0.316	25.000	3	2.00	0.631	100.00%	2.302	4.660	1.255	54.54%	26.93%
LTE 13	777	0.316	25.000	1.5	1.41	0.447	100.00%	2.474	5.180	0.889	35.89%	17.14%
LTE 26	814	0.316	25.000	1.5	1.41	0.447	100.00%	2.554	5.427	0.889	34.77%	16.37%
LTE 41	2496	0.316	25.000	4.5	2.82	0.891	100.00%	5.493	10.000	1.773	32.28%	17.73%
LTE 66	2570	0.316	25.000	3	2.00	0.631	100.00%	5.604	10.000	1.255	22.40%	12.55%
GSM 850	824	3.200	35.000	1.5	1.41	4.520	12.50%	2.576	5.493	1.124	43.65%	20.46%
GSM 1900	1850	1.600	32.000	3	2.00	3.192	12.50%	4.476	10.000	0.794	17.72%	7.93%
									Distance(m)=	0.200		
WLAN	2400	0.044	16.400	3	2.00	0.088	100.00%	5.348	10.000	0.175	3.25%	1.74%

Note1: The calculation is based on the distance of 20cm

Note 2: GSM has 12.50% duty cycle according to cellular module report under FCC ID: QIPPLS83-W

5.2 Conclusion:

The worst-case simultaneous transmission is LTE 12 simultaneous with WLAN, which is using 57.79% of IC limit and 28.67% of FCC limit. The equipment is passing RF exposure requirements for 20cm distance.

6 Revision History

Date	Report Name	Changes to report	Report prepared by
2022-02-16	EMC_PRATT-009-21001_FCC_ISED_MPE	Initial Version	Cheng Song
2022-03-16	EMC_PRATT-009-21001_FCC_ISED_MPE_Rev1	Updated calculation for LTE Band 26	Cheng Song

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