



Radio Frequency Exposure Evaluation Report

FOR:

Pratt & Whitney Engine Services

Model Number:

FAST / FAST-A-010-3_RevF, FAST / FAST-A-010-4_RevF

Product Description:

Data Collection and Transmission Unit

FCC ID: 2AJ6A-FAST34F

IC ID: 22451-FAST34F

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_005_19001_FCC_ISED_MPE

DATE: 2019-11-07



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2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
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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 Engine Services
Street Address:	249 Vanderbilt Avenue
City/Zip Code	Norwood, MA 02062
Country	USA

Identification of the Manufacturer

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

3 Equipment under Assessment

Marketing name:	Flight-data Acquisition Storage & Transmisasion
HW Version :	Rev F
SW Version :	3.0.0
Firmware Version Identification Number (FVIN):	N/A
Hardware Version Identification Number (HVIN):	FAST / FAST-A-010-3_RevF, FAST / FAST-A-010-4_RevF
Product Marketing Name (PMN):	Flight-data Acquisition Storage & Transmisasion
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 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> <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: Gemalto ▪ Model number: PLS62-W ▪ FCC/IC ID: QIPPLS62-W / 7830A-PLS62W ❖ <u>WLAN:</u> <ul style="list-style-type: none"> ▪ Module name: Ti-Wi BLE ▪ FCC/IC ID: TFB-TIWI1-01 / 5969A-TIWI101
Antenna Type and Cable Loss:	<ul style="list-style-type: none"> ❖ <u>Cellular:</u> <ul style="list-style-type: none"> ▪ Antenna maximum gain: <ul style="list-style-type: none"> ○ GSM 850: 1.5 dBi ○ GSM 1900: 3.0 dBi

	<ul style="list-style-type: none"> ○ 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 <p>❖ <u>WLAN:</u></p> <ul style="list-style-type: none"> ▪ Antenna gain: 1.5 dBi <p>❖ <u>Cellular Cable Loss for a typical 10 ft Cable:</u></p> <ul style="list-style-type: none"> ○ 698-960 MHz: 1.3dBi ○ 1710-2170 MHz: 2.0dB ○ 2400-2700 MHz: 2.4dB
<p>Maximum Conducted Output Power:</p>	<p>❖ <u>Cellular:</u> From modular grant [Watts]:</p> <ul style="list-style-type: none"> ▪ 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 <p>❖ <u>WLAN:</u> From modular grant [Watts]: 0.093</p>
<p>Power Supply/ Rated Operating Voltage Range:</p>	<p>Low 22VDC, Nominal 28VDC, High 32.2VDC</p>
<p>Operating Temperature Range:</p>	<p>Low -40° C, Nominal 25° C, High 70° C</p>
<p>Sample Revision:</p>	<p><input type="checkbox"/>Prototype Unit; <input type="checkbox"/>Production Unit; <input checked="" type="checkbox"/>Pre-Production</p>

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 2.1091(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 simultaneous transmission

- Evaluations are based on worst case power density limits for Canada.
- Calculations are made for 24 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 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	2.35	3.162	0.2	1.05	1.656 ¹	2.576	5.493	2.287	88.82%
GSM 1900	1850	1.035	3.162	1	1.26	1.990 ¹	4.476	10.000	2.750	61.42%
WCDMA II	1850	0.17	0.316	1	1.26	0.398	4.476	10.000	0.550	12.27%
WCDMA IV	1710	0.181	0.316	1	1.26	0.398	4.242	10.000	0.550	12.95%
WCDMA V	824	0.169	0.316	0.2	1.05	0.331	2.576	5.493	0.457	17.75%
LTE 2	1850	0.164	0.316	1	1.26	0.398	4.476	10.000	0.550	12.27%
LTE 4	1710	0.171	0.316	1	1.26	0.398	4.242	10.000	0.550	12.95%
LTE 5	824	0.203	0.316	0.2	1.05	0.331	2.576	5.493	0.457	17.75%
LTE 7	2500	0.134	0.316	2.1	1.62	0.512	5.499	10.000	0.708	12.88%
LTE 12	699	0.167	0.316	0.2	1.05	0.331	2.302	4.660	0.457	19.86%
WLAN	2400	0.093	0.147	1.5	1.41	0.208	5.348	10.000	0.287	5.35%

Note1: EIRP of GSM850 and GSM1900 are corrected for worst case DC 50%

Note2: The calculation is based on the distance of 24cm

5.2 Conclusion:

The worst-case simultaneous transmission is GSM 850 simultaneous with WLAN, which is using 94.17% of a limit of 100%. The equipment is passing RF exposure requirements for 24cm distance.

6 Revision History

Date	Report Name	Changes to report	Report prepared by
2019-11-07	EMC_PRATT_005_19001_FCC_ISED_MPE	Initial Release	Yuchan Lu