



# Radio Frequency Exposure Evaluation Report

**FOR:**

Pratt & Whitney Engine Services, DPHM Solutions

**Model:**

FAST-A-010-3\_RevG  
FAST-A-010-4\_RevG (Variant)

**Product Description:**

Flight Data acquisition, storage & transmission of data over Wi-Fi and Cellular to analytics center

**FCC ID:** 2AJ6A-FAST34G

**IC:** 22451-FAST34G

**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\_011\_22001\_FCC\_ISED\_RF\_Exposure\_Rev3

**DATE:** 2023-11-01



**CETECOM Inc.**

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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 Engine Services, DPHM Solutions	Flight Data acquisition, storage & transmission of data over Wi-Fi and Cellular to analytics center	FAST-A-010-3_RevG FAST-A-010-4_RevG (Variant)

### Report reviewed by: TCB Evaluator

Arndt Stoecker

2023-11-01 Compliance (Director of Regulatory Services)

Date	Section	Name	Signature
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### Responsible for the Report:

Cheng Song

2023-11-01 Compliance (EMC Engineer)

Date	Section	Name	Signature
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## 2 Administrative Data

### 2.1 Identification of the Testing Laboratory Issuing the Test Report

<b>Company Name:</b>	CETECOM Inc.
<b>Department:</b>	Compliance
<b>Street Address:</b>	411 Dixon Landing Road
<b>City/Zip Code</b>	Milpitas, CA 95035
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<b>Director of Regulatory Services:</b>	Arndt Stoecker
<b>Responsible Project Leader:</b>	Cathy Palacios

### 2.2 Identification of the Client / Manufacturer

<b>Client's Name:</b>	Pratt & Whitney Engine Services, DPHM Solutions
<b>Street Address:</b>	249 Vanderbilt Avenue
<b>City/Zip Code</b>	Norwood, MA 02062
<b>Country</b>	USA

### Identification of the Manufacturer

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

### 3 Equipment under Assessment

<b>Model:</b>	FAST-A-010-3_RevG FAST-A-010-4_RevG (Variant)
<b>Marketing Name:</b>	Flight-data Acquisition Storage & Transmission
<b>HW Version :</b>	G
<b>SW Version :</b>	3.6
<b>FCC-ID :</b>	2AJ6A-FAST34G
<b>IC:</b>	22451-FAST34G
<b>Product Description:</b>	Flight Data acquisition, storage & transmission of data over Wi-Fi and Cellular to analytics center
<b>Radio information:</b>	<p><b>Cellular:</b></p> <ul style="list-style-type: none"> <li>• Module: Gemalto PLS63-W, CAT-1</li> <li>• FCC ID: QIPPLS63-W; IC: 7830A-PLS63W</li> <li>• LTE; UMTS; GSM</li> </ul> <p><b>WLAN:</b></p> <ul style="list-style-type: none"> <li>• Module: Ti-Wi</li> <li>• FCC ID: TFB-TIWI1-01; IC: 5969A-TIWI101</li> <li>• 802.11 b/g/n (2.4 GHz)</li> </ul>
<b>Antenna Info:</b>	<p><b>Cellular:</b></p> <ul style="list-style-type: none"> <li>• 698-960 MHz, Max Gain: 1.5 dBi</li> <li>• 1710-2170 MHz, Max Gain: 3.0 dBi</li> <li>• 2500-2700 MHz, Max Gain: 4.5 dBi</li> </ul> <p><b>WLAN:</b></p> <ul style="list-style-type: none"> <li>• 2400-2500 MHz, Max Gain: 1.5 dBi</li> </ul>
<b>Power Supply/ Rated Operating Voltage Range</b>	Vmin: 22 VDC/ Vnom: 28 VDC / Vmax: 32.2 VDC
<b>Operating Temperature Range</b>	-40°C to 70 °C
<b>Sample Revision</b>	<input type="checkbox"/> Prototype Unit; <input type="checkbox"/> Production Unit; <input checked="" type="checkbox"/> Pre-Production
<b>Dimensions</b>	210mm x 68mm x 95mm
<b>Weight</b>	1.0 kg

## 4 RF Exposure Limits and FCC and IC Basic Rules

### 4.1 Routine Environmental Evaluation Categorical Exclusion Limits acc. to FCC 1.1307(b)(3)(i)(B).

Single RF sources is exempt if the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold  $P_{th}$  (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive).  $P_{th}$  is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}}(d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left( \frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

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

$d$  = the separation distance (cm);

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 Exemption Limits for Routine Evaluation – RF Exposure Evaluation per IC RSS-102 Issue 5 section 2.5.2

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz and the source-based, time-averaged maximum EIRP. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than  $4.49/f^{0.5}$  W (adjusted for tune-up tolerance), where  $f$  is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- 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;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

## 5 Evaluations

### 5.1 Analysis of RF Exposure

#### Duty Cycle

The table below illustrates the highest possible duty cycle for each type of radio during operation.

Mode	Duty Cycle	Duty Cycle Correction [dBm]
LTE	1:1	0
WCDMA	1:1	0
GSM	1:8	-9
WLAN	1:1	0

#### FCC:

Tech-Band	Freq-Low <sub>[GHz]</sub>	Pwr <sub>[dBm]</sub>	Pwr[dBm] corrected by Duty Cycle	Power <sub>[W]</sub>	Ant-G <sub>[dBi]</sub>	EIRP <sub>[W]</sub>	ERP <sub>[W]</sub>	FCC 2.1091(c)(1) Pth <sub>[mW]</sub> = ERP <sub>20cm</sub>
UMTS II	1.8524	25.00	25.00	0.316	3.00	0.631	0.385	3060.00
UMTS IV	1.7124	25.00	25.00	0.316	3.00	0.631	0.385	3060.00
UMTS V	0.8264	25.00	25.00	0.316	1.50	0.447	0.272	1685.86
LTE 2	1.8550	25.00	25.00	0.316	3.00	0.631	0.385	3060.00
LTE 4	1.7150	25.00	25.00	0.316	3.00	0.631	0.385	3060.00
LTE 5	0.829	25.00	25.00	0.316	1.5	0.447	0.272	1691.16
LTE 7	2.5050	25.00	25.00	0.316	4.50	0.891	0.543	3060.00
LTE 12	0.7040	25.00	25.00	0.316	1.50	0.447	0.272	1436.16
LTE 13	0.7795	25.00	25.00	0.316	1.50	0.447	0.272	1590.18
LTE 26	0.8190	25.00	25.00	0.316	1.50	0.447	0.272	1670.76
LTE 38	2.5750	25.00	25.00	0.316	4.50	0.891	0.543	3060.00
LTE 41	2.5010	25.00	25.00	0.316	4.50	0.891	0.543	3060.00
LTE 66	1.7150	25.00	25.00	0.316	3.00	0.631	0.385	3060.00
GSM850	0.8242	35.00	26.00	0.398	1.50	0.562	0.343	1681.37
GSM1900	1.8502	32.00	23.00	0.200	3.00	0.398	0.243	3060.00
Tech-Band	Freq-Low <sub>[GHz]</sub>	Pwr <sub>[dBm]</sub>	Pwr[dBm] corrected by Duty Cycle	Power <sub>[W]</sub>	Ant-G <sub>[dBi]</sub>	EIRP <sub>[W]</sub>	ERP <sub>[W]</sub>	FCC 2.1091(c)(1) Pth <sub>[mW]</sub> = ERP <sub>20cm</sub>
11.b ANT0	2.4120	19.70	19.70	0.093	1.50	0.132	0.080	3060.00

The worst simultaneous transmissions is GSM850 and Wi-Fi b:

TER = 0.266

RF exposure exemption applicable

**IC:**

Tech-Band	Freq-Low [MHZ]	Pwr <sub>[dBm]</sub>	Pwr[dBm] corrected by Duty Cycle	Power <sub>[W]</sub>	Ant-G [dBi]	EIRP <sub>[W]</sub>	Exemption limit for Routine Evaluation
UMTS II	1852.4	25.00	25.00	0.316	3.00	0.631	2.2
UMTS IV	1712.4	25.00	25.00	0.316	3	0.631	2.1
UMTS V	826.4	25.00	25.00	0.316	1.5	0.447	1.3
LTE 2	1855.0	25.00	25.00	0.316	3	0.631	2.2
LTE 4	1715.0	25.00	25.00	0.316	3	0.631	2.1
LTE 5	829.0	25.00	25.00	0.316	1.5	0.447	1.3
LTE 7	2505.0	25.00	25.00	0.316	4.5	0.891	2.8
LTE 12	704.0	25.00	25.00	0.316	1.5	0.447	1.2
LTE 13	779.5	25.00	25.00	0.316	1.5	0.447	1.2
LTE 26	819.0	25.00	25.00	0.316	1.5	0.447	1.3
LTE 38	2575.0	25.00	25.00	0.316	4.5	0.891	2.8
LTE 41	2501.0	25.00	25.00	0.316	4.5	0.891	2.8
LTE 66	1715.0	25.00	25.00	0.316	3	0.631	2.1
GSM850	824.2	35.00	26.00	0.398	1.5	0.562	1.3
GSM1900	1850.2	32.00	23.00	0.200	3	0.398	2.2
Tech-Band	Freq-Low [MHZ]	Pwr <sub>[dBm]</sub>	Pwr[dBm] corrected by Duty Cycle	Power <sub>[W]</sub>	Ant-G [dBi]	EIRP <sub>[W]</sub>	Exemption limit for Routine Evaluation
11.b ANTO	2412.0	19.7	19.7	0.093	1.5	0.132	2.68

The worst simultaneous transmissions is GSM850 and Wi-Fi b:  
 TER = 0.23  
 RF exposure exemption applicable



## 6 Revision History

Date	Report Name	Changes to report	Prepared by
2023-07-18	EMC_PRATT_011_22001_FCC_ISED_RF_Exposure	Initial Release	Cheng Song
2023-07-27	EMC_PRATT_011_22001_FCC_ISED_RF_Exposure_Rev1	Updated model number	Cheng Song
2023-10-27	EMC_PRATT_011_22001_FCC_ISED_RF_Exposure_Rev2	Updated section 5	Cheng Song
2023-11-01	EMC_PRATT_011_22001_FCC_ISED_RF_Exposure_Rev3	Updated Duty Cycle correction calculation	Cheng Song

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