



# 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.**

411 Dixon Landing Road ♦ Milpitas, CA 95035 ♦ U.S.A.

Phone: + 1 (408) 586 6200 ♦ Fax: + 1 (408) 586 6299 ♦ E-mail: [Contact@cetecom.com](mailto:Contact@cetecom.com) ♦ <http://www.cetecom.com>  
CETECOM Inc. is a Delaware Corporation with Corporation number: 2905571

## 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.

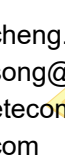
The device meets the limits as stipulated by the above given FCC and IC rule parts based on available specifications for worst case conditions at 20cm distance to the body.

| 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<br>FAST-A-010-4_RevG<br>(Variant) |

### Report reviewed by: TCB Evaluator

| 2023-11-01 | Compliance | Arndt Stoecker<br>(Director of Regulatory Services) |  Digitally signed by: Arndt Stoecker<br>DN: CN = Arndt Stoecker email = arndt.stoecker@cetecom.com<br>C = US O = CETECOM Inc<br>Date: 2023.11.08 17:06:36 -08'00' |
|------------|------------|-----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Date       | Section    | Name                                                | Signature                                                                                                                                                                                                                                             |

### Responsible for the Report:

| 2023-11-01 | Compliance | Cheng Song<br>(EMC Engineer) |  Digitally signed by: cheng.song@cetecom.com<br>DN: CN = cheng.song@cetecom.com<br>Date: 2023.11.01 15:24:47 -07'00' |
|------------|------------|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Date       | Section    | Name                         | Signature                                                                                                                                                                                                 |

## 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     |
| <b>Country</b>                          | USA                    |
| <b>Telephone:</b>                       | +1 (408) 586 6200      |
| <b>Fax:</b>                             | +1 (408) 586 6299      |
| <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<br>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>                          | <b>Cellular:</b> <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> <b>WLAN:</b> <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>                               | <b>Cellular:</b> <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> <b>WLAN:</b> <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[GHz] | Pwr[dBm] | Pwr[dBm]<br>corrected<br>by Duty<br>Cycle | Power[W] | Ant-G[dBi] | EIRP[W] | ERP[W] | FCC 2.1091(c)(1)<br>Pth[mW] = 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[GHz] | Pwr[dBm] | Pwr[dBm]<br>corrected<br>by Duty<br>Cycle | Power[W] | Ant-G[dBi] | EIRP[W] | ERP[W] | FCC 2.1091(c)(1)<br>Pth[mW] = 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]<br>corrected<br>by Duty<br>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]<br>corrected<br>by Duty<br>Cycle | Power <sub>[W]</sub> | Ant-G [dBi] | EIRP <sub>[W]</sub> | Exemption limit for Routine Evaluation |
| 11.b ANT0 | 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  |

<<< The End >>>