



Radio Frequency Exposure Evaluation Report

For:

Pratt & Whitney Engine Services, Inc.

Model:

FAST-A-010-3_E

Product Description:

Flight-data Acquisition, Storage & Transmission

FCC ID: 2AJ6A -FAST34E

IC ID: 22451-FAST34E

Per:

CFR Part Part 1 (1.1307 & 1.1310), Part 2 (2.1091),
FCC KDB 447498 D01 General RF Exposure Guidance v06

Report number: EMC_PRATT-002-16001_SAR-EX

DATE: 2017-06-23



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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 **distances greater than 30cm from the body of persons.**

Company	Description	Model #
Pratt & Whitney Engine Services, Inc.	Flight-data Acquisition, Storage & Transmission	FAST-A-010-3_E

Report reviewed by: TCB Evaluator

Kris Lazarov

June 23, 2017

Compliance

(Senior EMC Engineer)

Date	Section	Name	Signature
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Responsible for the Report:

James Donnellan

June 23, 2017

Compliance

(EMC Engineer)

Date	Section	Name	Signature
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The test results of this test report relate exclusively to the test item specified in Section 3.

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2 Administrative Data

Identification of the Testing Laboratory Issuing the Test Report

Company Name:	CETECOM Inc.
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Director Radio Com. and EMC:	Peter Nevermann
Responsible Project Leader:	James Donnellan

Identification of the Client / Manufacturer

Applicant's Name:	Pratt & Whitney Engine Services, Inc.
Street Address:	249 Vanderbilt Avenue
City/Zip Code	Norwood / 02062
Country	MA USA

3 Equipment under Assessment

Model No	FAST-A-010-3_E
FCC-ID	2AJ6A -FAST34E
IC ID	22451-FAST34E
Product Description	Flight-data Acquisition, Storage & Transmission
Device Category	☒ Fixed Installation ☒ Mobile ☐ Portable ☐ Mixed Mobile and Portable
Frequency Range	2412 MHz – 2467 MHz for WiFi 824.2 MHz -848.8 MHz for GPRS/EGPRS 850 826.4 MHz -846.6 MHz for UMTS V 1850.2 MHz -1909.8 MHz for GPRS/EGPRS 1900 1852.4 MHz -1907.6 MHz for UMTS II
Modes of Operation / Declared Output power	Max Power of cell module PHS8-P on 850MHz: 30.49dBm based on Report MDE_CINTE_1108 by 7 Layers Max Power of cell module PHS8-P on 1900MHz: 27.29dBm based on Report MDE_CINTE_1108 by 7 Layers Max Power of TiWi WiFi module: 20dBm based on TiWi-R2 TRANSCEIVER MODULE DATASHEET
Max. declared antenna gain	Cellular: IFMULT-SF00, 3dBi, Laird WiFi: WRR-2400-RPSMA-B, 1.3 dBi, Laird
Minimum distance of antenna or radiating parts to user	200 mm
Co-located Transmitters / Antennas	☒ Yes ☐ No
Sample Revision	☒ Prototype ☐ Production ☐ Pre-Production
Exposure Category	☐ Occupational/ Controlled ☒ General Population/ Uncontrolled

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 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);
operating frequency > 1.5GHz: excluded if ERP < 3.0W / 34.8dBm (EIRP: 36.9);

IC

300MHz <= operating frequency < 6 GHz: excluded if EIRP < $0.0131 \times f \text{ (MHz)}^{0.6834}$ W

4.2 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	$f \text{ (MHz)} / 1500$	30
1500 – 100.000	1.0	30

IC

300 – 6000	$0.02619 \times f \text{ (MHz)}^{0.6834}$	6
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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 to Exclude Routine RF Exposure Evaluation for Stand Alone Operation

This calculation is not required as simultaneous transmission must be investigated and exemption will only work for single transmitters.

5.2 RF Exposure Calculation for Stand Alone Operation

Values for maximum average cellular conducted output power were taken from MPE report for PHS8-P cellular module.

Values for maximum average output power 802.11 modules were taken from datasheet of module.

Values of gains are taken from operational description of host product.

Calculations are made for 30cm.

band	lowest frequency [MHz]	Maximum average conducted power [dBm]	Gain [dBi]	EIRP [dBm]	Power density @30cm [mW / cm / cm]	FCC power density limit [mW / cm / cm]	IC power density limit in [mW / cm / cm]	Result
UMTS II	1850.00	GPRS power is worst case	NA	NA	NA	NA	NA	NA
UMTS V	824.00	GPRS power is worst case	NA	NA	NA	NA	NA	NA
GPRS 1900	1850.00	27.29	3	30.29	0.09	1	0.45	Yes
GPRS 850	824.00	30.49	3	33.49	0.20	0.55	0.26	Yes
WiFi 2.4	2400	20	1.3	21.3	0.01	1	0.54	Yes

Conclusion:

- The equipment is meeting the RF exposure requirements for standalone operation of the included radios at distance >30cm.

5.3 RF Exposure Calculation for simultaneous transmission operation

band	Power density @30cm [mW / cm / cm]	FCC power density limit [mW / cm / cm]	IC power density limit in [mW / cm / cm]	Stand-alone limit ratio FCC	Stand-alone limit ratio IC	Worst case simultaneous transmission ratio	Limit for simultaneous transmission ratio	Result
UMTS II	GPRS power is worst	NA	NA	NA	NA	NA	100%	NA

	case							
UMTS V	GPRS power is worst case	NA	NA	NA	NA	NA	100%	NA
GPRS 1900	0.09	1	0.45	9%	20%	22%	100%	Pass
GPRS 850	0.20	0.55	0.26	37%	77%	79%	100%	Pass
WiFi 2.4	0.01	1	0.54	1%	2%	79%	100%	Pass

Conclusion:

- The equipment is meeting the RF exposure requirements for standalone operation of the included radios at distance >30cm.

6 Revision History

Date	Report Name	Changes to report	Report prepared by
June 23, 2017	EMC_PRATT_002- 16001_FCC_IC_MPE	Initial Release	James Donnellan