ELECTRONICS TEST CENTRE
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Canada

TEST PLAN

FOR

B/E AEROSPACE ENGINEERING AND CERTIFICATION

USE OF TPEDS ON THE BOMBARDIER XRS AIRCRAFT

IN ACCORDANCE WITH

RTCA DO294

Report No.: E48TP15-305 **Customer P.O. No.:** 508365

Test Personnel: Dan Zanette

Prepared for:
B/E Aerospace
25 Dunlop Ave.
Winnipeg, MB
R2X 2V2

Client Acceptance
Authorized Signatory

Dan Zanette
Technical Director

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Report Composition: Page 1 of 10

NVLAP LAB CODE 200282-0

1 Introduction

This test setup plan has been prepared by the Electronics Test Centre for B/E Aerospace.

This report describes the TPEDs emulation test setup details.

Testing on the Bombardier XRS is performed in accordance with RTCA DO-294.

2 REFERENCE DOCUMENTS

2.1 Government Documents

FCC Experimental License	Aircraft TPED testing Dallas Texas

2.2 B/E Aerospace documents

A SPEC A-TS-4040 March 16, 2014	B/E Aerospace Canada EMC Test Procedure

2.2 Non – government documents

ISO/IEC 17025:2005	General requirements for the competence of testing and calibration laboratories
RTCA DO294C December 16, 2008	Guidance on Allowing Transmitting Portable Electronic Devices (T-PEDs) on Aircraft
RTCA DO160	Environmental Conditions and Test Procedures for Airborne Equipment

3 TEST LEVELS AND FREQUENCIES

Frequency (MHz)	Polarization	Modulation 2kHz BW	Base Power Output	Output Drive Level adjusted to Generate a Required Test level of:
815.5	Vertical/Horizontal stirred*	PM	33 dBm	44 $dBm_{(EIRP)}$
		CW	33 dBm	44 $dBm_{(EIRP)}$
835.1	Vertical/Horizontal stirred*	PM	33 dBm	44 $dBm_{(EIRP)}$
		CW	33 dBm	44 $dBm_{(EIRP)}$
1880	Vertical/Horizontal stirred*	PM	30 dBm	41 $dBm_{(EIRP)}$
		CW	33 dBm	44 $dBm_{(EIRP)}$
2441	Vertical/Horizontal stirred*	PM	27 dBm	38 $dBm_{(EIRP)}$
		CW	27 dBm	38 $dBm_{(EIRP)}$
5500	Vertical/Horizontal stirred*	PM	30 dBm	41 $dBm_{(EIRP)}$
		CW	33 dBm	44 $dBm_{(EIRP)}$

Table 1: Transmitting Test levels and frequencies

TO ACHIEVE REQUIRED TEST LEVEL = BASE POWER + MEF(11dB) – ANTENNA GAIN

DRG HORN ANTENNA GAIN

Frequency MHz	Antenna Gain dBi
815	5.605
835.1	6.000
1880	8.889
2441	8.503
5500	10.458

Notes:

- Pulse Modulation: 200 Hz, OBW: 2 kHz
- No attempt to link to terrestrial cell sites
- Intent of testing is to verify safe operation of avionics during taxi
- Prior to testing, all doors and hatches are secured.
- E-fields monitored during testing

4 Test Setup

1) Load all required test equipment onto the aircraft under test.
2) Position test equipment at a location that will allow the least equipment movement when changing zone under test.
3) Review Test Plan with test crew.
4) Connect power cables to test equipment.
5) Setup transmitting antenna on a tripod in first zone under test.
6) Setup RF stirring paddle in zone under test and no closer than 0.25 meters from aircraft exits.
7) Setup E-field monitor on tripod no closer than 1 meter from transmitting antenna.
8) Power up all test equipment and allow 15 minutes for stabilization.
9) Connect output of signal generator to the input of the amplifier through a short low loss coaxial cable.
10) Connect the output of the amplifier to the spectrum analyser (or power meter) through a 10 (or 6m) meter low loss cable and a calibrated power attenuator.
11) Select the first frequency from test frequency/ power level table and perform a CW verification of the Base Power + MEF.
12) Record the signal generator drive level into the amplifier.
13) Repeat steps 9 and 10 for all test frequencies using the associated amplifiers.
14) Verify the repetition rate and duty cycle of the pulse modulation with the spectrum analyser.

    Note: Pulse repetition rate: 200Hz (5mS), Duty cycle: 12.5% (625uS pulse width)
15) With the signal generator RF output off and all amplifiers in standby, disconnect RF cable from the spectrum analyser, remove power attenuators and connect to transmitting antenna.

5 Test Procedure

1) With signal generator RF output OFF turn amplifier into operate mode and turn ON RF stirring paddles.
2) Indicate to flight-deck crew readiness to transmit. On flight-deck crew OK, turn on signal generator RF output at first test frequency.
3) Monitor electric fields in zone under test and record sample stirring level with E-field monitor.
4) Visually monitor cabin for any anomalies and if observed report to flight deck test crew.
5) Once flight-deck crew indicates completion of their system check tests, disable signal generator RF output.
6) Repeat steps 2 – 5 for all test frequencies and modulation.
7) Upon completion of all frequencies in both CW and PM, move transmitting antenna, RF stirring paddles and E-field monitor to next zone under test and repeat steps 1 – 6.

6 EQUIPMENT LIST

Asset #	Device	Characteristics	Manufacturer	Model	Serial #	Cal. Date	Cal. Due
541	Amplifier	500 MHz to 1 GHz	ETC	ETC	01	monitored	monitored
2325	Amplifier	1 GHz to 2 GHz	Hughes	1177H09F000	162	monitored	monitored
2335	Amplifier	4 GHz to 8 GHz	Varian	VZC6961K1DH	5371	monitored	monitored
7000	Amplifier	500 MHz to 2.7 GHz	Empower	BBM3K5OHM	02	monitored	monitored
7001	Amplifier	2.7 GHz to 6 GHz	Empower	BBM5K8CGM	03	monitored	monitored
6543	Signal Generator	250kHz-6GHz	Aeroflex	IFR3416	341006/332	10-Dec-15	10-Dec-16
6045	Antenna, DRG Horn	700 MHz - 18 GHz	AH Systems	SAS-571	1356	22-Jul-15	22-Jul-16
6416	E-field probe	10MHz-40GHz	ETS-Lindgren	HI-6053	00146320	6-Jun-15	6-Jun-16
4918	Amplifier	2 GHz to 4 GHz	Varian	VZS-6951KDH	5457	monitored	monitored
6429	Spectrum Analyzer	30Hz-26.5GHz	Hewlett Packard	8563E	3425A02555	22-Jul-15	22-Jul-16
5775	Camera	12x Optical Zoom	Canon	PSS31S	4158304848	monitored	monitored
6040	Power Supply	120Vac, 50, 60 ,400 Hz	Behlman	P1350	P0996	monitored	monitored
6025	Power Supply	120Vac, 50, 60 ,400 Hz	Behlman	P1350	P0997	monitored	monitored
6295	Switching DC Power Supply	1-30VDC, 1-20A	Extech	382275	0	monitored	monitored
6535	camera tripod	-	Manfrotto	MKC3-H01	T1084950	N/A	N/A
6586	10 Meter Low Loss Cable	20MHz-18GHz	A.H. Systems	SAC-18G-10	1424	Monitored	Monitored

Table 2: Test Equipment

Notes:

1) Attenuators and RF cables are verified prior to and during test

2) Dipole antennas with monitored status are strictly used for transmission of RF

7 FIGURES AND PHOTOGRAPHS

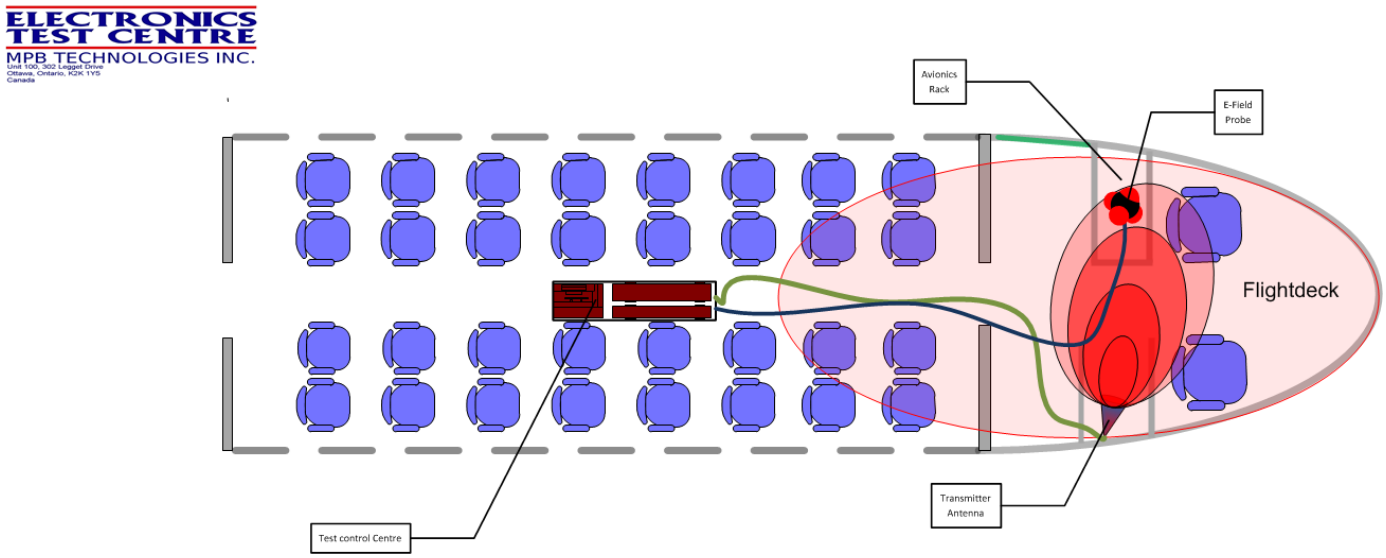

Figure 1: Test Layout

Photo 2: Typical Generator Drive to Amplifiers

Photo 1: Sample TPED Test Arrangement

8 DALLAS CONTACT INFORMATION

From: Drew Adams [mailto:Drew.Adams@aero.bombardier.com]
Sent: December-18-15 4:01 PM
To: Davide Iapalucci
Cc: Olivier Forget
Subject: RE: Quote #15-305 Rev 1 - - Estimated Shipping Costs

Hello Davide,

According to Google Maps, we'll be placing the aircraft at 32°50'22.5"N 96°50'28.0"W for engines-on testing.

Any in-hangar testing will be at 32°50'26.7"N 96°50'30.7"W.

Address:
7336 Aviation Place
Dallas, TX 75235

I will be the point of contact.

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9 FCC FILING APPLICATION INFO

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