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FCC PART 87 TEST REPORT

APPLICANT	ROCKWELL COLLINS
	AIR TRANSPORT SYSTEMS
	1300 WILSON BLVD. SUITE 200
	ARLINGTON VA 22209 USA
FCC ID	AJKPN822-2764
MODEL NUMBER	HFS-2200
PRODUCT DESCRIPTION	HF TRANSCEIVER
DATE SAMPLE RECEIVED	6/16/2011
DATE TESTED	7/26/2011
TESTED BY	Joe Scoglio
APPROVED BY	Mario R. de Aranzeta
TIMCO REPORT NO.	1325AT11TestReport.doc
TEST RESULTS	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL

**THE ATTACHED REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL
WITHOUT THE WRITTEN APPROVAL OF TIMCO ENGINEERING, INC.**



Certificate # 0955-01



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STATEMENT OF COMPLIANCE

This equipment has been tested in accordance with the standards identified in the referenced test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report and demonstrate that the equipment complies with the appropriate standards. No modifications were made to the equipment during testing in order to demonstrate compliance with these standards.

I attest that the necessary measurements were made by me or under my supervision, at Timco Engineering, Inc. located at 849 N.W. State Road 45, Newberry, Florida 32669 USA.

Authorized by: Mario R. de Aranzeta



Signature:

Function: Engineer/Lab Supervisor

Date: 7/26/2011

GENERAL INFORMATION

DUT Specification

The test results relate only to the items tested.	
DUT Description	HF TRANSCEIVER
FCC ID	AJKPN822-2764
Model Number	HFS-2200
Operating Frequency	2 to 30 MHz
Type of Emission	H1A, J2D, H3E, and J3E
DUT Power Source	<input checked="" type="checkbox"/> 115Vac/400Hz
	<input type="checkbox"/> DC Power 28 Vdc
	<input type="checkbox"/> Battery Operated Exclusively
Test Item	<input type="checkbox"/> Prototype
	<input type="checkbox"/> Pre-Production
	<input checked="" type="checkbox"/> Production
Type of Equipment	<input type="checkbox"/> Fixed
	<input checked="" type="checkbox"/> Mobile
	<input type="checkbox"/> Portable



Test Facility: The test sites used by Timco Engineering Inc. for collecting radiated and conducted emission data are located at 849 NW State Road 45 Newberry, FL 32669 USA.

Test Condition: The DUT was tested in the laboratory in an environment with normal temperature and humidity. The temperature was 26°C with a relative humidity of 50%.

Modification to the DUT: No modification was made to the DUT during testing.

Test Exercise (e.g software description, test signal, etc.): The DUT was placed in continuous transmit mode of operation.

Applicable Standards: ANSI/TIA 603-C: 2004
FCC CFR 47 Part 87

Part 2.1033(c) (4) Type of Emission: 100H1A, 2K8J2D, 2K8H3E, 2K8J3E,

$B_n = 2M$
 $M = 3000$
 $B_n = 2(3000) = 6k$

The authorized bandwidth is 6 kHz.

Part 2.1033(c)(8) DC Voltages and Current into Final Amplifier:

POWER INPUT:

FINAL AMPLIFIER ONLY

INPUT POWER – HIGH: (0 Vdc)(0A) = 0 Watts

EMC EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
3-Meter Semi-Anechoic Chamber	Panashield	N/A	N/A	Listed 5/10/10	5/10/12
AC Voltmeter	HP	400FL	2213A14499	CAL 6/12/11	6/12/13
Antenna: Dipole Kit	Electro-Metrics	TDA-30/1-4	153	CHAR 8/10/09	8/10/11
Antenna: Passive Loop	EMC Test Systems	EMCO 6512	9706-1211	CAL. 8/1/09	8/2/11
Frequency Counter	HP	5385A	2730A03025	CAL 9/4/09	9/4/11
Hygro-Thermometer	Extech	445703	0602	CAL 6/15/11	6/15/13
Modulation Analyzer	HP	8901A	3435A06868	CAL 8/26/09	8/26/11
Digital Multimeter	Fluke	FLUKE-77	35053830	CAL 11/18/09	11/18/11
Analyzer Tan Tower Preamplifier	HP	8449B-H02	3008A00372	CAL 11/21/09	11/21/11
Analyzer Tan Tower Quasi-Peak Adapter	HP	85650A	3303A01690	CAL 11/22/09	11/22/11
Analyzer Tan Tower RF Preselector	HP	85685A	3221A01400	CAL 11/21/09	11/21/11
Analyzer Tan Tower Spectrum Analyzer	HP	8566B Opt 462	3138A07786 3144A20661	CAL 11/24/09	11/24/11
Temperature Chamber	Tenney Engineering	TTRC	11717-7	CHAR 4/25/10	4/25/12
Antenna	ETS	3117	41534	9/22/2010	9/22/2012
Antenna	Electro metrics	LPA-25	1122	5/04/2011	5/04/2013
Antenna	Electro metrics	BIA-25	1171	1/15/2010	1/15/2012



TEST PROCEDURES

Power Line Conducted Interference: The procedure used was ANSI/TIA 603-C: 2004 using a 50uH LISN. Both lines were observed with the UUT transmitting. The bandwidth of the spectrum analyzer was 10 kHz with an appropriate sweep speed.

Bandwidth 20 dB: The measurements were made with the spectrum analyzer's resolution bandwidth (RBW) = 1 MHz and the video bandwidth (VBW) = 3 MHz and the span set as shown on plot.

Power Output: The RF power output was measured at the antenna feed point using a peak power meter.

Antenna Conducted Emissions: The RBW = 100 kHz, VBW = 300 kHz and the span set to 10.0 MHz and the spectrum was scanned from 30 MHz to the 10th Harmonic of the fundamental. Above 1 GHz the resolution bandwidth was 1 MHz and the VBW = 3 MHz and the span to 50 MHz.

Radiation Interference: The test procedure used was ANSI C63.4-2003 using an Agilent spectrum receiver with pre-selector. The bandwidth (RBW) of the spectrum receiver was 100 kHz up to 1 GHz and 1 MHz above 1 GHz with an appropriate sweep speed. The VBW above 1 GHz was 3 MHz. The analyzer was calibrated in dB above a microvolt at the output of the antenna.

RF POWER OUTPUT

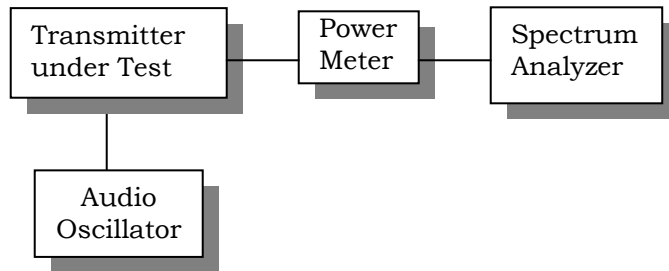
Rule Part No.: Part 2.1046(a), Part 87.131

Test Requirements:

Method of Measurement: RF power is measured by connecting a 50-ohm, resistive wattmeter to the RF output connector. With a nominal battery voltage, and the transmitter properly adjusted the RF output measures:

For the Device has a fixed antenna, RF power is measured as ERP as the antenna is permanently attached. The substitution method was used. With a nominal battery voltage, and the transmitter properly adjusted the RF output measures:

Test Setup Diagram:



Test Data:

OUTPUT POWER:

2.0 MHz		97.7 Watts
15.0 MHz		83.2 Watts
29.9 MHz		83.2 Watts

MODULATION CHARACTERISTICS

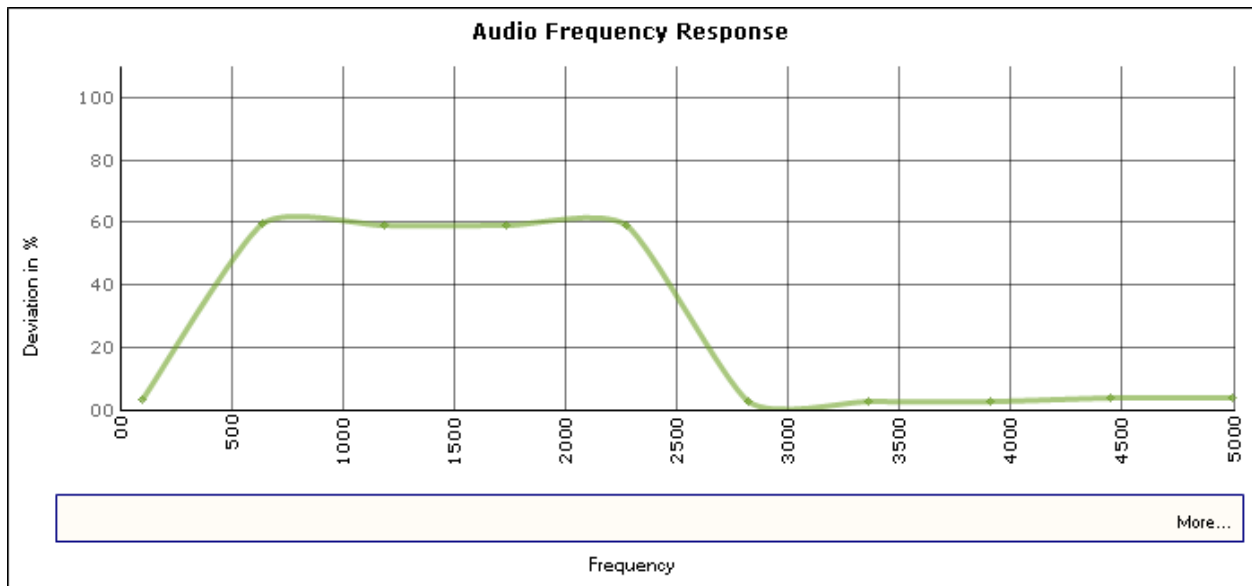
Rule Part No.: Part 2.1047(a)(b)

Test Requirements:

Method of Measurement:

Audio frequency response

The audio frequency response was measured in accordance with ANSI/TIA 603-C: 2004 with the exception that for an AM modulated transmitter the input was varied for a constant modulation of 20%. A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 – 5000Hz shall be submitted. The audio frequency response curve is shown below.



VOICE MODULATED COMMUNICATION EQUIPMENT

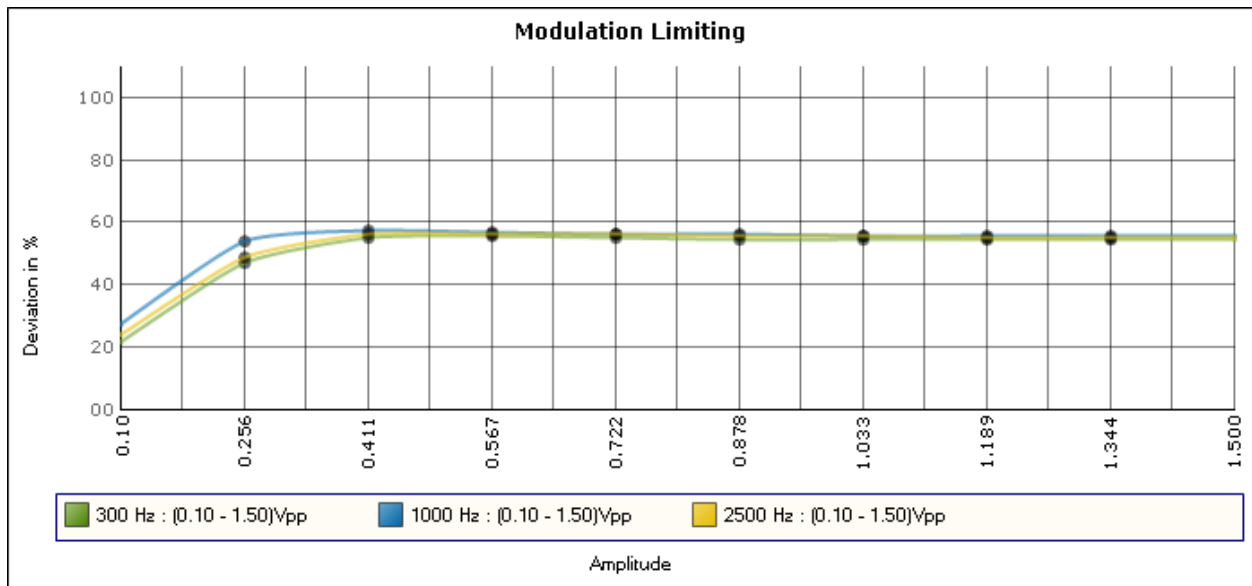
AUDIO INPUT VERSUS MODULATION

Rule Part No.: Part 2.1047(b) & 87.141

Test Requirements:

Method of Measurement: Modulation cannot exceed 100%, The audio input level needed for a particular percentage of modulation was measured in accordance with ANSI/TIA 603-C: 2004. The audio input curves versus modulation are shown below. Curves are provided for audio input frequencies of 300, 1000, and 2500 Hz.

Test data: Please see the plots below





AUDIO LOW PASS FILTER

Rule Part No.: Part 2.1047(a), Part 87.141(F)

Test Requirements:

Method of Measurement:

Test Data: Not applicable.

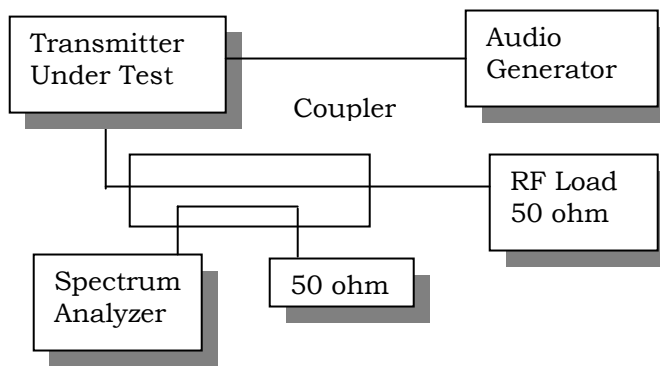
OCCUPIED BANDWIDTH

Rule Part No.: Part 2.1049, Part 87.139

Test Requirements: Data in the plots show that on any frequency removed from the assigned frequency by more than 250% of the authorized bandwidth: At least $43 + 10\log(P)$ dB.

Method of Measurement:

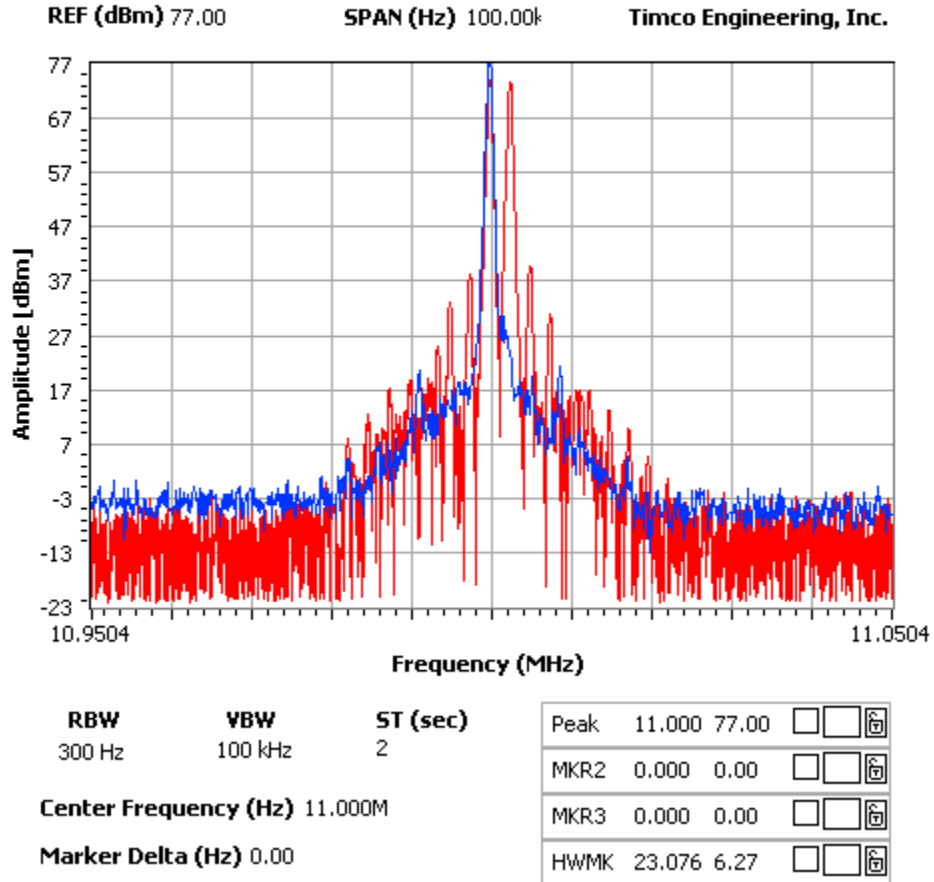
Test Setup Diagram:



Test Data: See the plots below

The authorized BW is 25 kHz.

NOTES:



Applicant: ROCKWELL COLLINS

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SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

Rule Part No.: Part 2.1051(a)

Requirements: $43+10\log(pY)= 55 \text{ dB}$

Method of Measurement: The carrier was modulated 100% using a 2500 Hz tone. The spectrum was scanned from 0.4 to at least the 10th harmonic of the fundamental. The measurements were made in accordance with standard ANSI/TIA-603-C: 2004.

Test Data:

Frequency MHz	dBc		Frequency MHz	dBc		Frequency MHz	dBc
2	0		15	0		29.9	0
4	64.8		30	82.3		59.9	74.2
6	71		45	71.4		89.9	57.6
8	75.3		60	85.9		119.9	84.9
10	79.8		75	91.7		149.9	79
12	NE		90	81.2		179.9	87.6
14	NE		105	62.4		209.9	90.1
16	NE		120	78.2		239.9	96.6
18	NE		135	90.7		269.8	91.5
20	NE		150	77.9		299.8	94

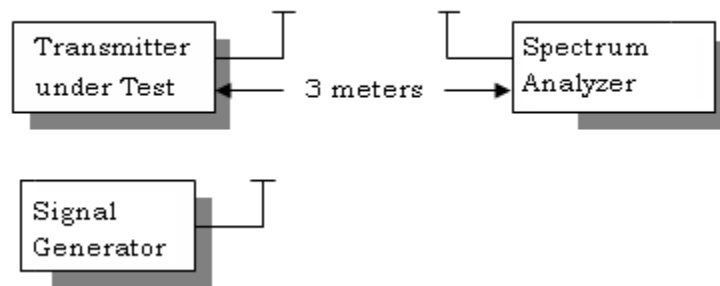
FIELD STRENGTH OF SPURIOUS EMISSIONS

Rule Parts. No.: Part 2.1053

Test Requirements: The FCC limits for radiated emissions are the same as previously stated for the conducted emissions.

Method of Measurements: The spectrum was scanned from 30 MHz to at least the tenth harmonic of the fundamental. This test was conducted per ANSI/TIA 603-C: 2004 using the substitution method.

Test Setup Diagram:



Test Data:

N/A

FREQUENCY STABILITY

Rule Parts. No.: Part 2.1055, Part 87.133

Requirements: Temperature range requirements: -30 to +50° C.
Voltage Variation +, -15% ±20 PPM

Method of Measurements: ANSI/TIA 603-C: 2004

Test Data:

Assigned Frequency (Ref. Frequency) (MHz)		11.000001
Temperature (°C)	Frequency (MHz)	Frequency Stability (PPM)
-30	11.000001	0.00
-20	11.000001	0.00
-10	11.000001	0.00
0	11.000001	0.00
+10	11.000001	0.00
+20	11.000001	0.00
+30	11.000001	0.00
+40	11.000001	0.00
+50	11.000001	0.00

Assigned Frequency (Ref. Frequency) (MHz)		11.000001
% Battery (%)	Frequency (MHz)	Frequency Stability (PPM)
-15%	11.000001	0.0
		0.0
+15%	11.000001	0.0

POWER LINE CONDUCTED INTERFERENCE

Rules Part No.: Part 15.207

Requirements:

Frequency (MHz)	Quasi Peak Limits (dB μ V)	Average Limits (dB μ V)
0.15 – 0.5	66 – 56	56 – 46
0.5 – 5.0	56	46
5.0 – 30	60	50

Test Procedure: ANSI C63.4-2003.
The spectrum was scanned from 0.15 to 30 MHz.

Test Data: Not applicable