



Nemko Test Report: 28105RUS2Rev1

Applicant: ELDEC Corporation
16700 13th Avenue West
Lynnwood, WA 98046
USA

**Equipment Under Test:
(E.U.T.)** Main Landing Gear Axle Remote Data Concentrator

FCC Identifier: U7C142129

In Accordance With: **FCC Part 15, Subpart C, Paragraph 15.209 and 15.205**
General Limits For Low Power Transmitters

Tested By: Nemko USA, Inc.
802 N. Kealy
Lewisville, TX 75057

TESTED BY:  **DATE:** 27 July 2009
David Light, Senior Wireless Engineer

APPROVED BY:  **DATE:** 1 October 2009
Tom Tidwell, Telecom Direct

Total Number of Pages: 16

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Record of Document Changes

Rev.	Changes	Author	Date
1	Added comments on page 5 to describe test setup more precisely. Added comments on page 6 to explain the effects of varying the power input level. Added power supply and multimeter to test equipment list.	T. Tidwell	1 Oct 09

EQUIPMENT: Main Landing Gear Axle Remote Data
Concentrator

Test Report
No.:28105RUS2Rev1

Section 1. Summary Of Test Results

Manufacturer: ELDEC Corporation

Model No.: Main Landing Gear Axle Remote Data Concentrator

Serial No.: 246478-36

Part No.: 142-129-01

General: **All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 15, Subpart C for low power devices. All tests were conducted using measurement procedure ANSI C63.4-2003. Radiated Emissions were made on an open area test site and an FCC registered semi-anechoic chamber.



New Submission



Production Unit



Class II Permissive Change



Pre-Production Unit

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE.

See " Summary of Test Data".



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This report applies only to the items tested.

Summary Of Test Data

NAME OF TEST	PARA. NO.	RESULT
Radiated Emissions in Restricted Bands	15.205	Complies
Powerline Conducted Emissions	15.207	NA
Radiated Emissions	15.209	Complies
Occupied Bandwidth	Not Specified	Complies

Footnotes For N/A's:

This device does not connect to the AC mains and is powered via the aircraft's electrical distribution system.

Section 2. General Equipment Specification

Frequency Range: 134.2 kHz

Operating Frequency(ies) of Sample: 134.2 kHz

Modulation: AM

Crystal Frequencies: 32 MHz

Integral Antenna

Yes



No



Description of EUT

The Main Landing Gear (MLG) Axle Remote Data Concentrator (ARDC) is a microprocessor based design permanently installed on the 787 aircraft to measure tire pressure. The MLG ARDC provides additional functionality including wheel speed and brake temperature monitoring.

The Main Landing Gear (MLG) Axle Remote Data Concentrator (ARDC) is a axle hub mounted digital electronics assembly that communicates with a wheel rim mounted Tire Pressure Sensor (TPS). The TPS is passive with no independent power source. Communication between the ARDC and TPS utilizes a 134.2 KHz sine wave with superimposed 4 KHz data.

For the purposes of testing the ARDC, the circuit was mounted in a metal axle hub and wheel assembly just as it would be configured when installed on the aircraft. Power of 38.5 Vdc was supplied to the circuit via a laboratory bench supply.

Section 3. Radiated Emissions

NAME OF TEST: Radiated Emissions	PARA. NO.: 15.205 & 15.209
TESTED BY: David Light	DATE: 20 July 2009

Test Results:

Complies. The worst case emission was 69.3 dB μ V/m at 134.2 kHz. This is 35.7 dB below the specification limit of 105 dB μ V/m. For the purposes of this measurement a distance correction factor was applied using a 40 dB/decade square of inverse linear distance extrapolation factor in accordance with 15.31(f)(4).

Measurement Data: See attached table.

Calculation of 3 meter limit:

Limit for fundamental emission = $2400/134.2 = 18 \text{ uV/m@300m}$ or 25.1 dBuV/m@300m

Distance correction factor = $40 \log (300/3) = 80 \text{ dB}$

Thus, the limit of 25.1 dBuV/m@300m would extrapolate to 105 dBuV/m@3m

Notes:

The device was tested from 134 kHz to the tenth harmonic of the highest fundamental frequency per 15.33

The supply voltage was varied from 30.2 – 43.9 Vdc (+/-15%) with no measureable change in the radiated field strength level.

The device was tested at 3 meters and 10 meters. The emissions were not detectable at distances greater than 3 meters. There were no spurious emissions detected above the recorded noise floor.

Analyzer Settings: 9 kHz to 150 kHz RBW/VBW = 300 Hz
150 kHz to 30 MHz RBW/VBW = 10 kHz

Equipment Used: 1733-1783-1767

Measurement Uncertainty: $\pm 3.6 \text{ dB}$

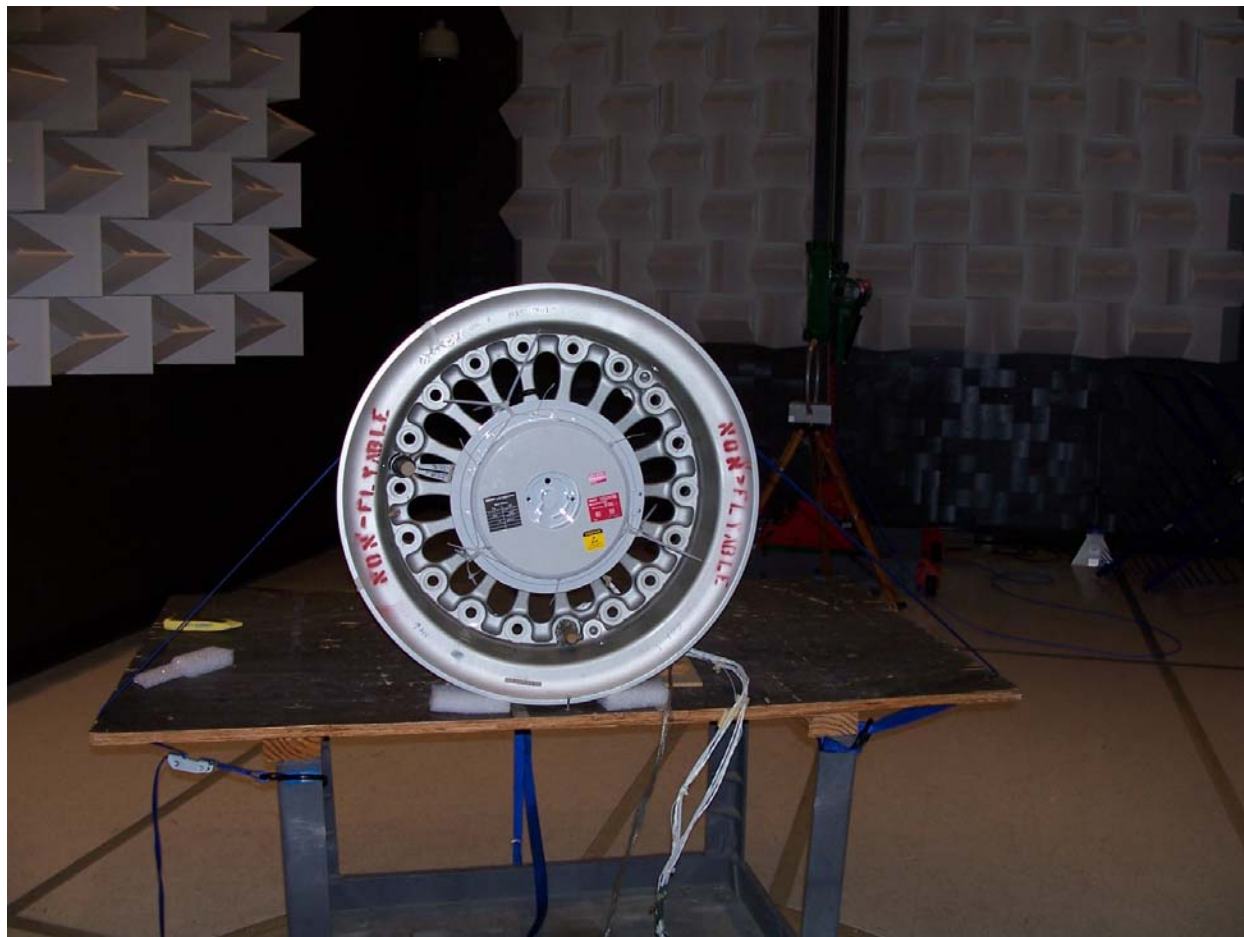
Temperature: $22 \text{ }^{\circ}\text{C}$

Relative Humidity: $30 \text{ } \%$

Test Data - Radiated Emissions

Meas. Freq. (kHz)	Ant. Pol. (H/V)	Atten. (dB)	Meter Reading (dBuV)	Antenna Factor (dB)	Path Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail Unc.	Comment
134.25	Loop	0	50.9	17.4	1.0	0.0	69.3	105.0	-35.7	Pass	Carrier 300 Hz RBW
268.5	Loop	0	42.6	17.2	1.0	0.0	60.8	99.0	-38.2	Pass	Noise floor 10 kHz RBW
402.75	Loop	0	38.3	17.2	1.0	0.0	56.5	95.5	-39.0	Pass	Noise floor 10 kHz RBW
537	Loop	0	35.2	17.4	1.0	0.0	53.6	73.0	-19.4	Pass	Noise floor 10 kHz RBW
671.25	Loop	0	33.5	17.3	1.0	0.0	51.8	71.1	-19.3	Pass	Noise floor 10 kHz RBW
805.5	Loop	0	31.2	17.3	1.0	0.0	49.5	69.5	-20.0	Pass	Noise floor 10 kHz RBW
939.75	Loop	0	29.3	17.4	1.0	0.0	47.7	68.1	-20.4	Pass	Noise floor 10 kHz RBW
1074	Loop	0	28.5	17.6	1.0	0.0	47.1	67.0	-19.9	Pass	Noise floor 10 kHz RBW
1208.3	Loop	0	28	17.6	1.0	0.0	46.6	66.0	-19.4	Pass	Noise floor 10 kHz RBW
1342.5	Loop	0	24	17.6	1.0	0.0	42.6	65.0	-22.4	Pass	Noise floor 10 kHz RBW
											Main Gear
											All measurements were
											made using a peak
											detector.
											All measurements were
											made at 3 meters.
											The carrier was
											undetectable at farther
											distances.

Radiated Photographs



Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: N/A
TESTED BY: David Light	DATE: 21 July 2009

Minimum Standard: Not specified.

Test Results: The 20 dB bandwidth is 28.7 kHz

Measurement Data: See attached graph(s).

Method of Measurement:

A spectrum analyzer was used to measure the 20 dB bandwidth of the fundamental emission. This value is used as the bandwidth for the emission designator.

Test Data – 20 dB Occupied Bandwidth



Date: 22.JUL.2009 09:35:38

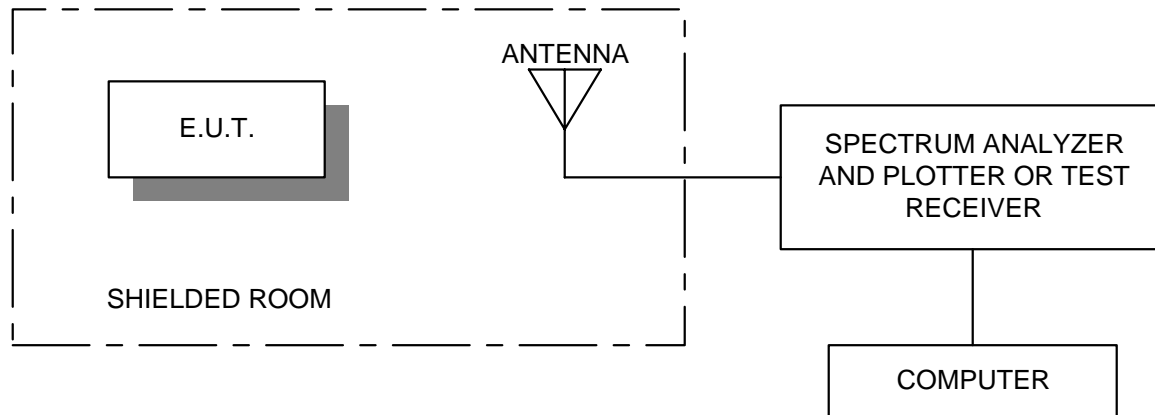
Section 5. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1733	Active Loop	EMCO 6507	45939	06/11/08	08/11/09
1783	Cable	Nemko 0	0	08/20/08	08/20/09
1767	EMI Test Receiver 20Hz - 26.5 GHz - 150 - +30 dBm	LCD ROHDE & SCHWARZ ESIB26	837491/0002	09/20/07	09/20/09
802	Near Field Probe Set	EMCO 7405	103	N/A	N/A
1082	CABLE 2m	Astrolab 32027-2-29094-72TC	N/A	CBU	N/A
600	POWER SUPPLY	XANTREX XFR 60-46	42664	CNR	N/A
286	Multimeter - True RMS	FLUKE LK352-FM	67310138	06/17/09	06/17/10

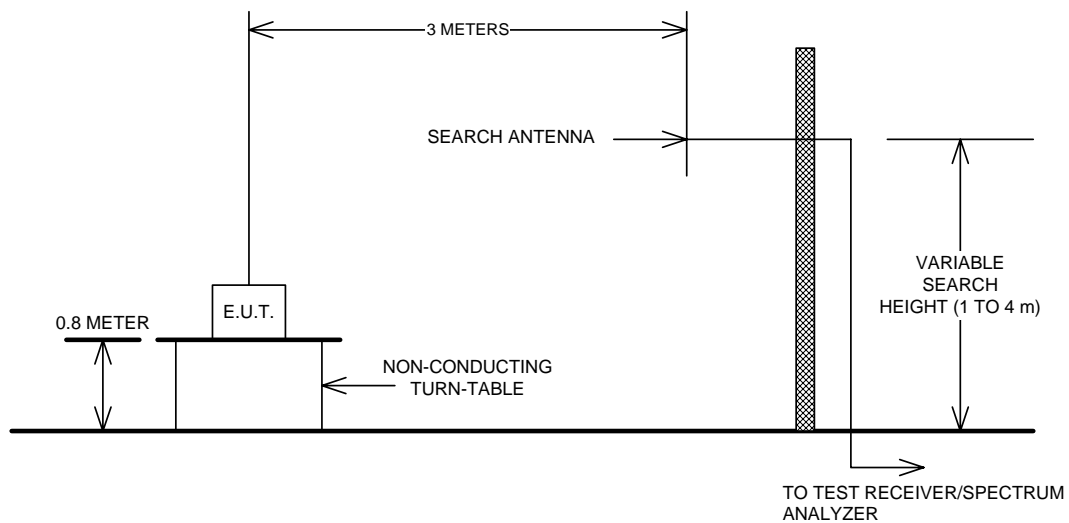
ANNEX A

TEST DIAGRAMS

Radiated Prescan



Test Site For Radiated Emissions



ANNEX B

TEST DETAILS

NAME OF TEST: Radiated Emissions

PARA. NO.: 15.209

Minimum Standard: §15.207 Radiated limits. (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009-0.490	2400F / (kHz)	300
0.490-1.705	24000F / (kHz)	30
1.705-30.0	30	30
30-88	100 ¹	3
88-216	150 ²	3
216-960	200 ³	3
Above 960	500	3

(b) In the emission table above, the tighter limit applies at the band edges.

(c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other sections within this part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.

(d) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

(e) The provisions in §§15.31, 15.33, and 15.35 for measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.

(f) In accordance with §15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation of a digital device. If measurements above the tenth harmonic are so required, the radiated emissions above the tenth harmonic shall comply with the general radiated emission limits applicable to the incorporated digital device, as shown in §15.109 and as based on the frequency of the emission being measured, or, except for emissions contained in the restricted frequency bands shown in §15.205, the limit on spurious emissions specified for the intentional radiator, whichever is the higher limit. Emissions which must be measured above the tenth harmonic of the highest

fundamental frequency designed to be emitted by the intentional radiator and which fall within the restricted bands shall comply with the general radiated emission limits in [§15.109](#) that are applicable to the incorporated digital device.

(g) Perimeter protection systems may operate in the 54-72 MHz and 76-88 MHz bands under the provisions of this section. The use of such perimeter protection systems is limited to industrial, business and commercial applications.