

# Delta Controls Inc.

## eM410R4 Rev. 3.1

### Permissive Change Test Report

Per

FCC CFR47 Part 15 Subpart C §15.247  
&  
IC RSS-210

FCC ID: YRR-eM410R4  
IC ID: 9100A-eM410R4

Revision 1.1

January 18, 2011

Approval		
Checked By:	Signature	Date
		January 18, 2011
	Robert E. Stirling, P.Eng.	Date

Protocol Data Systems Inc. EMC Lab,  
Abbotsford BC, Canada.  
SCC ISO/17025 (CAN-P-4E) Accredited Laboratory No. 612  
FCC O.A.T.S. Registration Number 96437  
Industry Canada O.A.T.S. Registration Number IC3384

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## Section I: Report of Measurements Testing Information

### GENERAL INFORMATION:

Applicant Company Name	Delta Controls Inc.
Address	17850 56 <sup>th</sup> Ave
	Surrey, British Columbia V3S 1C7 Canada
	Phone: 604-574-9444
	Fax: 6048887642
Contact Person	Mr. Alan Zhou
Email	azhou@deltacontrols.com
Product Name	eM410R4 Rev. 3.1
FRN	0019662998
Applicable Standard	FCC Part 15.247 & IC RSS-210
Test Results	Pass
Related Report/s Approval	03498 _Rev 1.0.pdf
Statement of Compliance	This equipment has been tested in accordance with the standards identified in the referenced test report. To the best of our 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. – Signature on Front Cover Page.

### EQUIPMENT UNDER TEST SPECIFICATIONS:

Manufacturer	Delta Controls Inc.
Product Description	Tyre pressure sensing and transmitting equipment
FCC ID	YRR-eM410R4
IC Number	9100A-eM410R4
Model Number	eM410 R4 Rev. 3.1
Name	eM410 R4 Rev. 3.1
Operating Frequency	2.410- 2465 GHz
Emission Designator	760KK7D
EUT Power Source	120Vac/60Hz and 230Vac/50Hz
Test Item	Production Unit
Type of Equipment	Fixed
Antennas	Monopole Antenna
Antenna Connector	RP-SMA RA Connector
Test Voltage	120Vac/60Hz and 230Vac/50Hz

### TEST DATA:

Test Facility	Protocol Data Systems Inc.
	4741 Olund Rd.
	Abbotsford, BC V4X 2E7
	Phone: 604-504-0091
	Fax: 604-554-0091
	Email: info@protocol-emc.com
	Website: www.protocol-emc.com
Test Facility ID's	SCC ISO/17025 (CAN-P-4E) Accredited Laboratory No. 612
	FCC O.A.T.S. Registration Number 96437
	Industry Canada O.A.T.S. Registration Number IC3384
Date Tested	10 and 11 January 2011
Tested By	Robert E. Stirling

**TEST SET-UP**

Test Supporting Equipment	
Test Exercise E.g. software description, test signal, etc.	The EUT was set for continuous transmit mode of operation. It only has 1 frequency. The options were for a CW and modulated frequency.
Deviation from Standard/s	No deviation from Standard
Modification to the EUT	No modifications were made.

**TEST EQUIPMENT LIST**

Manufacturer	Model	Equipment Description	Serial No.	Next Cal
HP	85650A	CDN Quasi-Peak Adapter	2811A01080	12/08/11
HP	85662A	Spectrum Analyzer Display	2152A03569	11/08/11
HP	8566B	Spectrum Analyzer RF Section	2241A02102	11/08/11
HP	85685A	RF-Preselector	3107A01222	11/08/11
EMCO	3146	Ant Log Periodic 200-1000MHZ	9611-4699	08/08/11
EMCO	3110B	Ant Biconical 20-300MHz	9401-1850	08/08/11
EMCO	3115	Horn Antenna 1-18GHz	9403-4251	20/08/11
EMCO	3825/2	LISN	2470	20/07/11
Rhientech	Custom	Antenna Mast	N/A	N/A
Protocol EMC	Custom	Turntable	N/A	N/A

**MEASUREMENT UNCERTAINTY**

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-5}$
Total RF power, conducted	$\pm 1,5$ dB
RF power density, conducted	$\pm 3$ dB
Spurious emissions, conducted	$\pm 3$ dB
All emissions, radiated	$\pm 3$ dB
Temperature	$\pm 1$ $^{\circ}$ C
Humidity	$\pm 5$ %
DC and low frequency voltages	$\pm 3$ %

**EQUIPMENT UNDER TEST:****TEST SYSTEM:**

NAME: Delta Controls Inc.

ADDRESS: 17850 56<sup>th</sup> Ave. Surrey BC  
V3S 1C7 Canada

CONTACT PERSON: Mr. Alan Zhou

EMAIL: azhou@deltacontrols.com

PHONE NUMBER: 6045749444 ext. 8358

FAX: 6045747793

**Equipment Under Test**

THE TEST SYSTEM: EUT 1: eM-410R4 Rev. 3.1  
Manufacturer: Delta Controls Inc.  
Serial Number: 55572/0025  
Part Number: 698246

## CABLING:

Cable	Pins	Connector	Load/Termination?	Shielded?	Ferrite's?
18AWG	IP1	2/3 Pin Connector	0-10V	No	No
18AWG	IP2	2/3 Pin Connector	100Ω	No	No
18AWG	IP3	2/3 Pin Connector	0Ω (Short CCT)	No	No
18AWG	IP4	2/3 Pin Connector	ON/OFF	No	No
18AWG	OP1	2/3 Pin Connector	0-10V	No	No
18AWG	OP2	2/3 Pin Connector	100Ω	No	No
18AWG	OP3	2/3 Pin Connector	100Ω	No	No
18AWG	OP4-5	2/3 Pin Connector	ON/OFF	No	No

## Section II: Report of Measurements Test Procedure

### RADIATION INTERFERENCE:

The measurement was made per ANSI C63.4-2003 using an Agilent model 8566B spectrum analyzer, a model 85685A Preselector, a model 85650A quasi-peak adapter, and the appropriate antenna. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The resolution bandwidth was 100kHz with an appropriate sweep speed and the video bandwidth was 300kHz up to 1GHz and 1MHz with a VBW greater than or equal to the RBW above 1GHz. When an emission was found, the table was rotated to produce the maximum, signal strength. The antenna was placed in both the horizontal and vertical planes and the worse case emissions were reported. The EUT was re-positioned to produce the highest emission level. The spectrum was searched to at least the tenth (10) harmonic of the fundamental.

### FORMULA OF CONVERSION FACTORS:

The field strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dB $\mu$ V) to the antenna correction factor supplied by the antenna manufacturer. The antenna correction factors are stated in terms of dB. The gain of the Preselector was accounted for in the spectrum analyzer meter reading.

Example:

$$\begin{array}{lllll} \text{Freq (MHz)} & \text{Meter Reading} & +\text{ACF} & +\text{CL} & = \text{FS} \\ 330 & 20 \text{ dB}\mu\text{V} & +10.36 \text{ dB} & +0.5 & = 30.86 \text{ dB}\mu\text{V/m} @ 3\text{m} \end{array}$$

Where the field strength was too low to get an accurate reading at the required distance of 3meters, the Antenna was moved closer to 1 meter. The resulting measurement was distance corrected for 3 meters by using the formula:

$$(1 \text{ meter result}) - (20\text{Log(measured distance/required distance)}) = (3 \text{ meter result})$$

Example:

$$\begin{aligned} 1 \text{ meter result} + \text{distance correction} &= 3 \text{ meter result} \\ 54.5 \text{ dB}\mu\text{V} + -9.54\text{dB} &= 45 \text{ dB}\mu\text{V} \end{aligned}$$

### POWER LINE CONDUCTED INTERFERENCE:

The procedure used was ANSI C63.4-2003 using a 50 $\mu$ H LISN. Both lines were observed. The bandwidth of the spectrum analyzer was 10kHz with an appropriate sweep speed. The spectrum was scanned from 0.15 to 30MHz. The measurement was performed on an Open Air Test Site at 0.8meters above the horizontal ground plane.

### OCCUPIED BANDWIDTH:

A sample of the transmitter output detected by an antenna was fed into the spectrum analyzer and the attached plot was printed. The vertical scale is set to 10dB per division.

### ANSI C63.4-2003 MEASUREMENT PROCEDURES:

The EUT was placed in a horizontal orientation, lying flat, on top of a table 80 cm high and with dimensions of 1m by 1.5m. The EUT was placed in the center of the table (1.m side). The table used for radiated measurements is capable of continuous rotation.

When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m. The antenna was placed in both the horizontal and vertical planes.

Due to the construction of the EUT, the EUT was also placed in a vertical orientation and rotated on its axis and the emissions were maximized again to identify the highest emission level.

Frequencies less than 1GHz were measured using the Quasi-Peak receiver. Frequencies equal to and greater than 1GHz were measured using the Average receiver

## **Section III: Measurements of Receiver Spurious Emissions**

**TEST STANDARD:** IC RSS-210

**REQUIREMENTS:** (d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

Frequency	Field Strength of Fundamental ( $\mu$ V/m)	Measurement Distance (meters)
9 to 490 kHz	2400/F(kHz)	300
490 to 1705 kHz	24000/F(kHz)	30
1705 to 30 MHz	30	30
30 – 88 MHz	100	3
80 – 216 MHz	150	3
216 – 960 MHz	200	3
Above 960 MHz	500	3

**TEST DATA:** See Appendix B for receiver spurious radiated emissions.

**MODIFICATIONS:** No modifications were made to the EUT to pass this test.

**PERFORMANCE:** Complies with the requirement as per IC RSS-210.

## **Section IV: Measurements to Power Line Conducted Emissions**

**TEST DATE:** January 11<sup>th</sup> 2011

**TEST STANDARD:** FCC Part 15 Subpart C §15.207

**REQUIREMENTS:** (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30MHz, shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

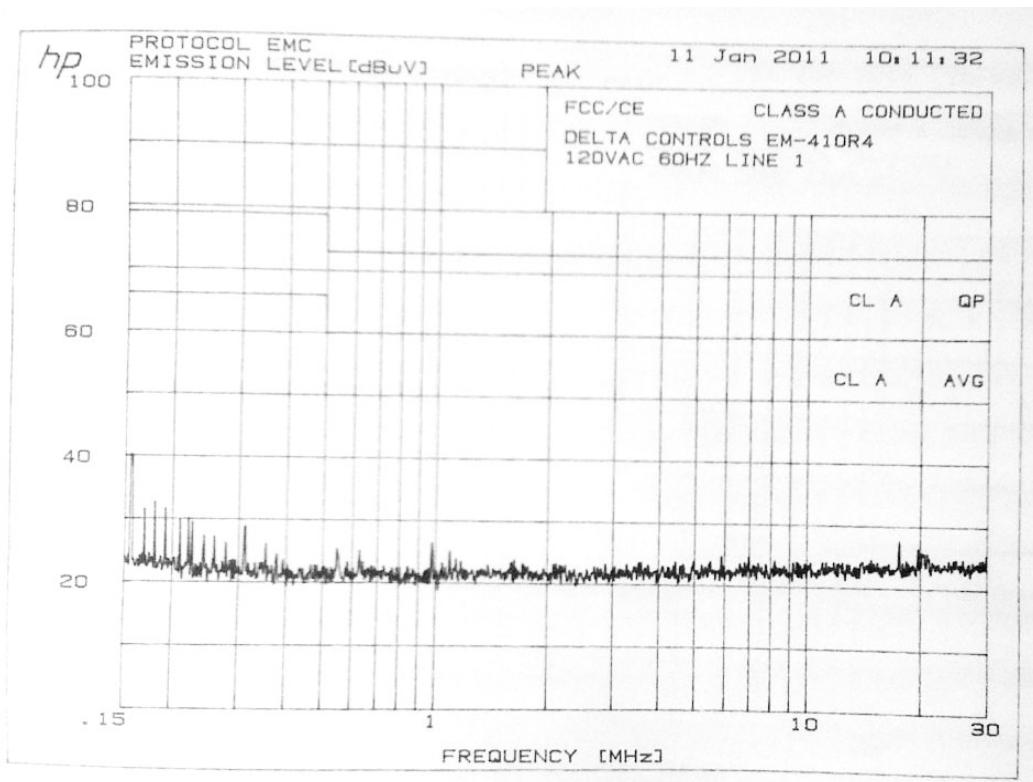
Frequency	Quasi Peak Limits	Average Limits
MHz	dB $\mu$ V	dB $\mu$ V
0.15 – 0.5	66 – 56	56 – 46
0.5 – 5.0	56	46
5.0 – 30	60	50

**TEST DATA:** See Appendix B for Conducted emissions data.

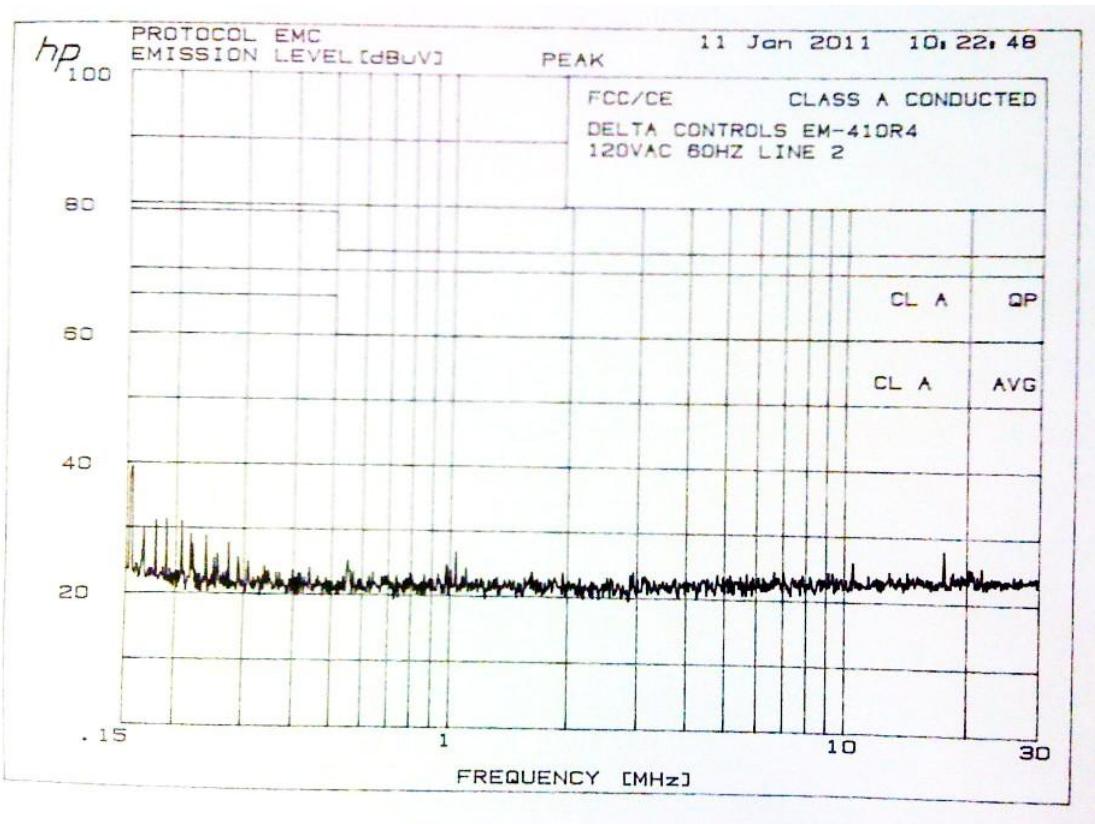
**MODIFICATIONS:** No modifications were made to the EUT to pass this test.

**PERFORMANCE:** Complies with the requirement as per FCC Part 15.247 and IC RSS-210.

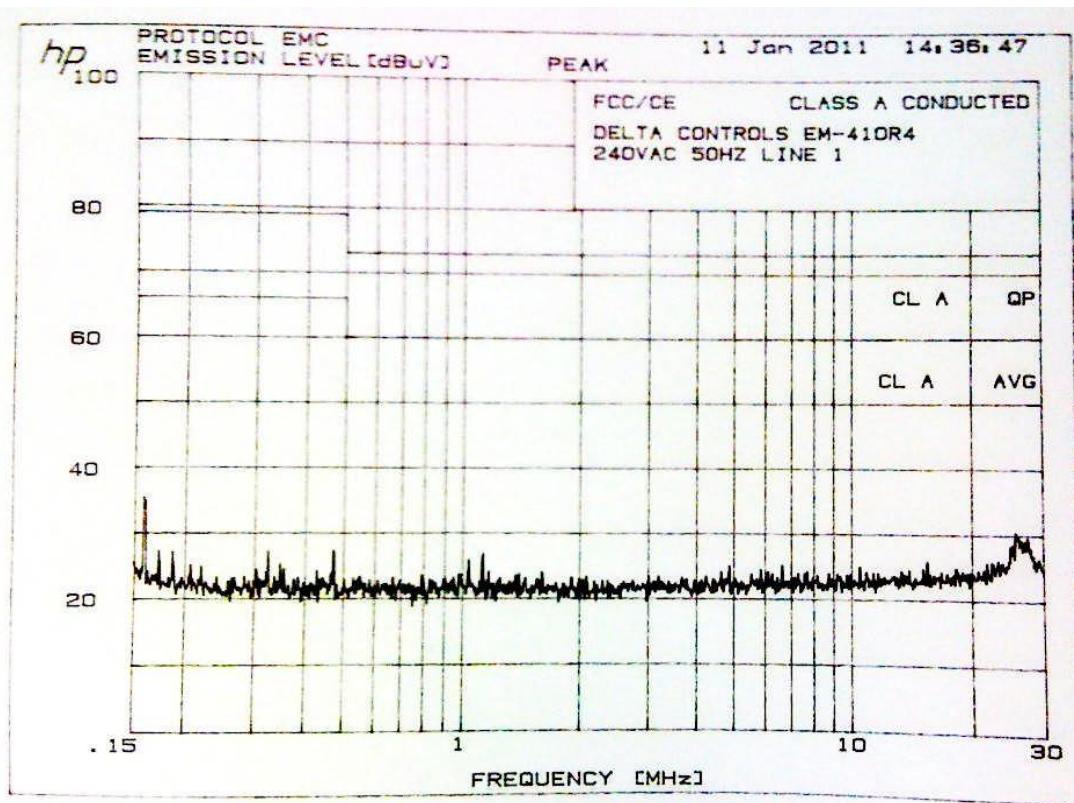
## Appendix A: Measurement Plots



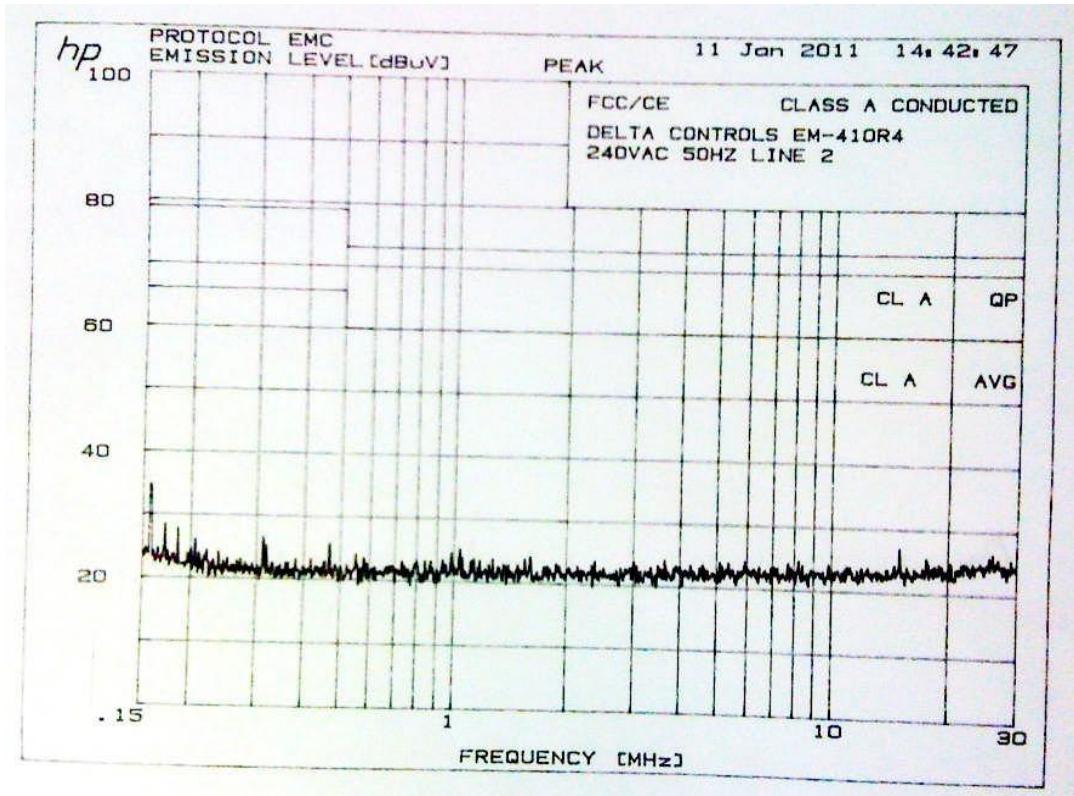
Conducted Emissions Line1 120Vac/60Hz



Conducted Emissions Line 2 120Vac/60Hz



Conducted Emissions Line1 240Vac/50Hz



Conducted Emissions Line2 240Vac/50Hz

## Measurement Data

## Receiver Spurious Emissions (FCC/Industry Canada Class A Limit)

Frequency (MHz)	Pol	Hgt (m)	Angle (deg)	Uncor-Pk (dB $\mu$ V)	Tot Corr (dB)	Peak (dB $\mu$ V/m)	Dellim-Pk (dB)
69.916000	Vert	1.0	20	13.80	11.96	25.76	-23.77
112.960000	Vert	1.0	90	10.20	14.15	24.35	-29.65
127.206000	Vert	1.0	270	12.60	14.37	27.97	-26.03
216.240000	Horz	1.5	200	10.90	13.94	24.84	-32.06
240.600000	Horz	1.6	190	12.80	14.52	27.32	-29.58

## Conducted Emissions Data

## Line 1 AC Mains 120Vac, 60Hz Peaks

Frequency (MHz)	Peak (dB $\mu$ V)	Dellim-Pk (dB)
.1565	40.2	-25.8
.1805	32.6	-33.4
.9821	26.4	-33.6
.1924	31.6	-34.4
.1694	31.5	-34.5

## Line 2 AC Mains 120Vac, 60Hz Peaks

Frequency (MHz)	Peak (dB $\mu$ V)	Dellim-Pk (dB)
.1548	39.3	-26.7
1.041	26.7	.33.3
.1903	31.3	-34.7
.1786	31	-34.9
.2083	29.8	-35

## Line 1 AC Mains 230Vac, 50Hz Peaks

Frequency (MHz)	Peak (dB $\mu$ V)	Dellim-Pk (dB)
.1582	35.4	-30.6
1.133	26.8	-33.2
.4731	27.4	-38.2
.3249	27.3	-38.7

## Line 2 AC Mains 230Vac, 50Hz Peaks

Frequency (MHz)	Peak (dB $\mu$ V)	Dellim-Pk (dB)
.1573	34.7	-31.3
.1721	28.5	-37.5
.3131	26.6	-39.4

**Note: No other measureable conducted or radiated emissions above -20 dB.**

## Appendix B: Test Set-Up Pictures



Test Setup for Conducted Emissions



Test Setup for Radiated Emission