

Dust Networks

TEST REPORT FOR

2.4 GHz Wireless Mote, M2510

Tested To The Following Standards:

ETSI EN 301 489-17 V2.1.1

Report No.: 91302-10

Date of issue: February 9, 2011



TESTING
CERT #803.01, 803.02,
803.05, 803.06

This test report bears the accreditation symbol indicating that the testing performed herein meets the test and reporting requirements of ISO/IEC 17025 under the applicable scope of EMC testing for CKC Laboratories, Inc.

We strive to create long-term, trust based relationships by providing sound, adaptive, customer first testing services. We embrace each of our customers' unique EMC challenges, not as an interruption to set processes, but rather as the reason we are in business.

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ADMINISTRATIVE INFORMATION

Test Report Information

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Project Number: 91302

DATE OF EQUIPMENT RECEIPT:


January 27, 2011

DATE(S) OF TESTING:

January 27, 2011

Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the sample equipment tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.

A handwritten signature in black ink, reading "Steve Behm", is positioned above a horizontal line.

Steve Behm
Director of Quality Assurance & Engineering Services
CKC Laboratories, Inc.

Test Facility Information



Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

TEST LOCATION(S):

CKC Laboratories, Inc.
22116 23rd Drive S.E., Suite A
Bothell, WA 98021-4413

SUMMARY OF RESULTS

Standard / Specification: ETSI EN 301 489-17 V2.1.1 / ETSI EN 301 489-1 V1.8.1

Description	Test Procedure/Method	Results
Conducted Emissions	EN 301 489-17 V2.1.1	NA
Radiated Emissions	EN 301 489-17 V2.1.1	NA
Harmonic Emissions	EN 61000-3-2 (2006) +A1	NA
Voltage Fluctuations and Flicker Emissions	EN 61000-3-3 (1995)	NA
Radiated Immunity	EN 61000-4-3 (2006)	Pass
Electrostatic Discharge	EN 61000-4-2 (2001)	NA
Electrical Fast Transient Burst	EN 61000-4-4 (2004)	NA
Transients and Surges in the Vehicle Environment	ISO 7637-2 (2004)	NA
Conducted Immunity	EN 61000-4-6 (2005)	NA
Voltage Dips and Interrupts	EN 61000-4-11 (2004)	NA
Surge	EN 61000-4-5 (2006)	NA

NA = Not Applicable

Conditions During Testing

This list is a summary of the conditions noted for or modifications made to the equipment during testing.

Summary of Conditions
None

EQUIPMENT UNDER TEST

The following model has been tested by CKC Laboratories: **M2510**

The manufacturer states that the following additional model is identical electrically to the one which was tested, or any differences between them do not affect their EMC characteristics, and therefore they meet the level of testing equivalent to the tested model: **M2140**

EQUIPMENT UNDER TEST

2.4 GHz Wireless Mote

Manuf: Dust Networks
Model: M2510
Serial: NA

2dBi Antenna

Manuf: NA
Model: NA
Serial: NA

PERIPHERAL DEVICES

The EUT was tested with the following peripheral device(s):

Network Manager

Manuf: Dust Networks
Model: DLM2610
Serial: 1603

Laptop

Manuf: Dell
Model: Inspiron 600m
Serial: NA

ETSI EN 301 489-17 V2.1.1

This report contains EMC emissions and immunity test results under European Union (CE) requirements.

Conducted Emissions

Test Notes: Conducted Disturbances at Mains Terminals, LISN method.

Test Procedure: ETSI EN 301 489-1

NA = Conducted Emissions test is not applicable because the EUT does not use AC power.

Radiated Emissions

Test Notes: Radiated disturbances emanating from enclosure.

Test Procedure: ETSI EN 301 489-1

NA = Radiated emissions test is not applicable per EN 301 489-1 §8.2; this equipment either does not have associated ancillary equipment or the radio in combination with the ancillary equipment was tested under the relevant product standard for the effective use of spectrum.

Harmonic Emissions

Test Notes: Conducted disturbances of current harmonics emanating from equipment power supply to low-voltage public power networks.

Test Procedure: EN 61000-3-2

Harmonics Emissions Results Table

Standard	Test	Pass/Fail
EN 61000-3-2	Harmonic Emissions	NA

NA = Not Applicable because the EUT does not use AC power.

Voltage Fluctuation and Flicker Emissions

Test Notes: Conducted disturbances of voltage fluctuations and flicker emanating from equipment power supply to low-voltage public power networks.

Test Procedure: EN 61000-3-3

Voltage Fluctuation and Flicker Emissions Results Table

Standard	Test	Pass/Fail
EN 61000-3-3	Voltage Fluctuations and Flicker Emissions	NA

NA = Not Applicable because the EUT does not use AC power.

Immunity Setup and Monitoring

Equipment Setup: The EUT is located in the front edge of the test table. EUT is communicating wirelessly with a network manager (DLM2650), the manager is connected to a support laptop.

Degradation: Any loss of communication with the manager or disruption in the functionalities of the EUT is considered degradation.

Monitoring: At the end of the test a command is entered into the laptop to view the connection status of the EUT with the network manager. There is also a video camera located inside the chamber aimed at the laptop screen to make sure there is no disconnection during the test.

Radiated Immunity

Test Notes: Immunity threat to simulate radiated electro-magnetic fields.

Test Procedure: EN 61000-4-3

Testing performed in chamber: Bothell C2

CT=Continuous [phenomena applied to] Transmitters

CR=Continuous [phenomena applied to] Receivers

Ancillary Equipment not in connection with a receiver or transmitter shall have pass/fail criteria specified by the manufacturer.

Radiated Immunity Performance Criteria (ETSI EN 301 489-17 Subclause 6.3 and 6.5)

Criteria	During Test	After Test
A	<p>Operate as intended May show degradation of performance * No loss of function No unintentional transmissions</p> <p><i>For Transmitters CT - tests shall be repeated in standby mode.</i></p> <p><i>For transceivers-CR only: Under no circumstances shall the transmitter operate unintentionally during the test.</i></p>	<p>Operate as intended No degradation of performance * No loss of function No loss of stored data or user programmable functions</p>

*See standard for more detail.

Test Engineer:

Test Equipment					
Asset/Serial #	Description	Model	Manufacturer	Cal Date	Cal Due
01491	Antenna	3143	EMCO	NCR	NCR
01412	Antenna	3115	EMCO	10/12/2009	10/12/2011
02126	Amplifier	757FCM	Kalmus	07/28/2009	07/28/2011
02633	Amplifier	A300L	Logimetrics	09/01/2009	09/01/2011
00995A	Amplifier	8020H01	Hughes	09/01/2009	09/01/2011
01977	Directional Coupler	C5571	Werlatone	03/26/2009	03/26/2011
05304	Directional Coupler	C223E-20	ATM	01/19/2011	01/19/2013
02872	Spectrum Analyzer	E4440A	Agilent	08/25/2009	08/25/2011
03203	Signal Generator	E4428C	Agilent	09/17/2009	09/17/2011

NCR = No Calibration Required.

Test Data

Radiated Immunity Results Table							
Frequency Range MHz	3 V/m with 80% AM Modulation at 1kHz	Test Distance (m)	Front V/H	Back V/H	Left Side V/H	Right Side V/H	Performance Criteria
80-1000	Pass	1.4	Pass	Pass	Pass	Pass	CT / CR / A
1400-2700	Pass	2	Pass	Pass	Pass	Pass	CT / CR / A

V=Vertical, H=Horizontal

Test Setup Photos



Front



Back



Left



Right

Electrostatic Discharge

Test Notes: Immunity threat to simulate static electrical charges directly from an operator or from adjacent objects.

Test Procedure: EN 61000-4-2

Test Data

ESD Indirect Discharge Results Table			
Location	<u>Indirect Discharge</u> Contact ± 4 kV		Performance Criteria
	VCP Pass / Fail	HCP Pass / Fail	
Front	NA	NA	NA
Back	NA	NA	NA
Left Side	NA	NA	NA
Right Side	NA	NA	NA
Bottom	NA	NA	NA

VCP=Vertical Coupling Plane, HCP=Horizontal Coupling Plane

NA = Testing is not required because the EUT is a module.

ESD Direct Discharge Results Table			
Location	<u>Direct Discharge</u>		Performance Criteria
	Contact ± 4 kV Pass / Fail	Air ± 8 kV Pass / Fail	
Front	NA	NA	NA
Back	NA	NA	NA
Left Side	NA	NA	NA
Right Side	NA	NA	NA
Top	NA	NA	NA

NA = Testing is not required because the EUT is a module.

Electrical Fast Transients / Bursts – Mains Power Lines

Test Notes: Immunity threat to simulate electrical fast transient signals and bursts.

Test Procedure: EN 61000-4-4

Test Data

EFT/B Mains Power Lines Results Table			
EFTB Insertion Point	+ 1 kV Pass / Fail	- 1 kV Pass / Fail	Performance Criteria
Line to Ground	NA	NA	NA
Neutral to Ground	NA	NA	NA
Protective Earth to Ground	NA	NA	NA
Line/Neutral/Protective Earth to Ground	NA	NA	NA

NA=Not Applicable because the EUT does not use AC power.

Electrical Fast Transients / Bursts - IO Lines

Test Notes: Immunity threat to simulate electrical fast transient signals and bursts.

Test Procedure: EN 61000-4-4

Test Data

EFT/B IO Lines Results Table			
Cable Tested	+ 0.5 kV Pass / Fail	- 0.5 kV Pass / Fail	Performance Criteria
Signal Lines	NA	NA	NA
Control Lines	NA	NA	NA
DC power input	NA	NA	NA

NA=Not Applicable because the EUT does not have Control Lines, DC Power Lines and all signal lines are shorter than 3 meters.

Transients and Surges in the Vehicle Environment - 12VDC Supply

Test Data

Transients and Surges in the Vehicle Environment - 12VDC Supply Results Table		
Test Pulse	Pass/Fail	Performance Criteria
1	NA	NA
2	NA	NA
3a	NA	NA
3b	NA	NA
4	NA	NA
7	NA	NA

NA = Not Applicable because this test is only required for units that will be used in a vehicular environment.

Transients and Surges in the Vehicle Environment - 24VDC Supply

Test Data

Transients and Surges in the Vehicle Environment - 24VDC Supply Results Table		
Test Pulse	Pass/Fail	Performance Criteria
1a	NA	NA
1b	NA	NA
2	NA	NA
3a	NA	NA
3b	NA	NA
4	NA	NA

NA = Not Applicable because this test is only required for units that will be used in a vehicular environment.

Conducted Immunity

Test Notes: Immunity threat to simulate low frequency radiated electro-magnetic fields having at least one conducting cable.

Test Procedure: EN 61000-4-6

Test Data

Conducted Immunity Results Table				
Cable Tested:	Amplitude	Frequency Range	Pass/Fail	Performance Criteria / Met
AC Power	3 Vrms	.150-80MHz	NA	NA
Signal Line	3 Vrms	.150-80MHz	NA	NA

NA=Not Applicable because the EUT does not use AC power and all signal lines are shorter than 3 meters.

Voltage Dips and Interrupts

Test Notes: Immunity threat to simulate low-voltage power supply network voltage dips and interruptions of long duration.

Test Procedure: EN 61000-4-11

Test Data

Voltage Dips and Interrupts Results Table			
Interrupts (% of nominal)	Time	Pass/Fail	Performance Criteria
30% of nominal	10ms	NA	NA
60% of nominal	100ms	NA	NA
>95% of nominal	5 secs	NA	NA

NA=Not Applicable because the ETU does not use AC power.

Surge

Test Notes: Immunity threat to simulate unidirectional surges caused by over voltages from switching and lightning transients.

Test Procedure: EN 61000-4-5

Test Data

Surge Results Table						
Voltage level kV	Insertion Points	0 degrees Pass / Fail		90 degrees Pass / Fail		Performance Criteria
		+	-	+	-	
.5 kV	Line 1 – line 2	NA		NA		NA
1 kV	Line 1 – ground	NA		NA		NA
1 kV	Line 2 – ground	NA		NA		NA

NA=Not Applicable because the EUT does not use AC power.

SUPPLEMENTAL INFORMATION

Immunity Test Details

EN 61000-4-3 Field Intensity at 0.4m

Chamber (80-1000)	1V/m Testing	3V/m Testing	10V/m Testing	20V/m Testing	30V/m Testing
Fremont C1	1.0	3.1	10.2	NA	NA
Fremont C2	0.8	2.8	10.1	13.2	NA
Mariposa	0.9	2.9	10.2	NA	NA
Brea	1.0	3.0	17.4	NA	NA
Bothell C1	1.1	2.9	9.8	19.0	27.4
Bothell C2	.07	2.7	9.2	NA	NA

NA = Not applicable because these levels are not performed in this chamber.