

Dust Networks

TEST REPORT FOR

**802.15.4 Wireless Mesh Mote
Model: ETERNA1**

Tested To The Following Standard:

EN 300 328 V2.1.1

Report No.: 98876-10

Date of issue: January 4, 2017



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

REPORT PREPARED FOR:

Dust Networks
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Union City, CA 94587

Representative: Gordon Charles
Customer Reference Number: 8783B

DATE OF EQUIPMENT RECEIPT:

DATE(S) OF TESTING:

REPORT PREPARED BY:

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Project Number: 98876

December 1, 2016

December 1, 2016

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.



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.
110 Olinda Place
Brea, CA 92823

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.02

SUMMARY OF RESULTS

Standard / Specification: EN 300 328 V2.1.1

Test Procedure/Method	Description	Modifications	Results
Transmitter Parameters			
Sub clause 4.3.1.2	RF Power Output	NA	NP
Sub clause 4.3.1.3	Duty Cycle, Tx Sequence, Tx-gap	NA	NP
Sub clause 4.3.1.4	Accumulated Transmit Time, Frequency Occupation & Hopping Sequence	NA	NP
Sub clause 4.3.1.5	Hopping Frequency Separation	NA	NP
Sub clause 4.3.1.6	Medium Utilisation (MU) Factor	NA	NP
Sub clause 4.3.1.7	Adaptivity	NA	NP
Sub clause 4.3.1.8	Occupied Channel Bandwidth	NA	NP
Sub clause 4.3.1.9	Transmitter Unwanted Emissions in the OOB Domain	NA	NP
Sub clause 4.3.1.10	Transmitter Unwanted Emissions in the Spurious Domain - Conducted	NA	NP
Sub clause 4.3.1.10	Transmitter Unwanted Emissions in the Spurious Domain - Radiated	NA	NP
Receiver Parameters			
Sub clause 4.3.1.11	Receiver Spurious Emissions - Conducted	NA	NP
Sub clause 4.3.1.11	Receiver Spurious Emissions - Radiated	NA	NP
Sub clause 4.3.1.12	Receiver Blocking	NA	Pass

NA = Not Applicable

NP = CKC Laboratories was not contracted to perform test.

Modifications During Testing

This list is a summary of the modifications made to the equipment during testing.

Summary of Conditions
No modifications were made during testing.

Modifications listed above must be incorporated into all production units.

Conditions During Testing

This list is a summary of the conditions noted to the equipment during testing.

Summary of Conditions
The testing performed was to show compliance to the updated standard version from V1.9.1 to V2.1.1. Only tests results required to show continued compliance are included in this report.

EQUIPMENT UNDER TEST

During testing numerous configurations may have been utilized. The configurations listed below support compliance to the standard(s) listed in the Summary of Results section.

Configuration 1

Equipment Tested:

Device	Manufacturer	Model #	S/N
802.15.4 Wireless Mesh Mote	Dust Networks	ETERNA1	00170d000058c07f

Support Equipment:

Device	Manufacturer	Model #	S/N
Laptop Computer	Lenovo	X61	LV-L6XN2
Raspberry Pi	PIMORONI	M1 3501-A0 C3	NA
Network Manager	Dust Networks	DLM6000-01EE	NA
Eterna Serial Programmer	Dust Networks	DC9010	NA
Eterna Serial Programmer	Dust Networks	DC9010	NA

General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Plug-In Card (Module)
Manufacturer declares the Type of FHSS:	Non-Adaptive
Operating Frequency Range:	2405MHz to 2475MHz
Conducted Output Power:	+8dBm
Modulation Type(s):	OQPSK
Nominal Channel Bandwidth(s):	2.7MHz
Number of TX Chains:	1
Number of RX Chains:	1
Antenna Gain (A):	4.8dBi
Beamforming Gain (Y):	NA
Antenna Connection Type:	Integral
Nominal Input Voltage:	3.0V
Operating Temperature Range:	-45C to +85C
Firmware / Software used for Test:	HTML5 Terminal
Geo-Location Capability:	Not Supported

Adaptive Mode(s)

Product Information	Manufacturer-Provided Details
Adaptivity Type:	NA
Number of Hopping Frequencies:	15
Manufacturer declares the Average Dwell Time per Channel:	10ms
Manufacturer declares the Max Channel Occupancy Time:	<4.5ms

NA = Not Applicable

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4.3.1 TECHNICAL REQUIREMENTS

4.3.1.12 Receiver Blocking

Test Setup/Conditions			
Test Location:	Brea Lab A	Test Engineer:	S. Yamamoto
Test Method:	EN 300 328 v2.1.1 §5.4.11	Test Date(s):	12/1/2016
Configuration:	1		
Test Setup:	Setup per Figure 6 of ETSI EN 300 328 V2.1.1. Tested in accordance with Section 5.4.11 of ETSI EN 300 328 V2.1.1		

Environmental Conditions			
Temperature (°C)	22	Relative Humidity (%):	42

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
03419	Signal Generator	Agilent	E4438C	7/8/2015	7/8/2017
P06662	Cable	Gore	PHASEFLEX EJR01N01024.0	4/5/2016	4/5/2018
02672	Spectrum Analyzer	Agilent	E4446A	9/30/2015	9/30/2017
P06982	Attenuator	Narda	766-20	1/6/2015	1/6/2017
01578	Attenuator	Bird	25-A-MFN-30	9/14/2015	9/14/2017
P05301	Directional Coupler	ATM	C223E-20	5/6/2016	5/6/2018
02946	Cable	Astrolab Inc.	32022-2-2909K-36TC	11/2/2015	11/2/2017
P06794	Splitter/Combiner	Anaren	41130	6/11/2015	6/11/2017
02475	Attenuator	HP	8494B	6/29/2015	6/29/2017
03429	Attenuator	HP	8496B	8/27/2015	8/27/2017

Receiver Blocking – Category 2 Equipment

Mean power from companion device	Mode	Blocking frequency (MHz)	Blocking signal power (in front of the UUT antenna) (dBm)	Packet Error Rate (PER) Measured (%)	Packet Error Rate (PER) Limit (%)	Results
Pmin + 6 dB	Frequency hopping	2380	-57	2.2	≤ 10	Pass
Pmin + 6 dB		2503.5	-57	1.2	≤ 10	Pass
Pmin + 6 dB	Frequency hopping	2300	-47	0.6	≤ 10	Pass
Pmin + 6 dB		2583.5	-47	0.5	≤ 10	Pass
Pmin + 6 dB	Frequency hopping	2380	-47*	9.2	≤ 10	Pass
Pmin + 6 dB		2503.5	-47*	8.0	≤ 10	Pass
Pmin + 6 dB	Frequency hopping	2300	-37*	1.0	≤ 10	Pass
Pmin + 6 dB		2583.5	-37*	1.0	≤ 10	Pass

*These test levels were performed per manufacturer request. They are 10dB higher than the standard requirement.

Test Setup Photo



SUPPLEMENTAL INFORMATION

Measurement Uncertainty

Parameter Uncertainty	Actual	Limit	Unit of Measure
Uncertainty Parameter	Actual	Limit	Unit of Measure
Occupied Channel Bandwidth	1	5	%
RF output power, conducted	0.67	1.5	dB
Power Spectral Density, conducted	0.67	3	dB
Unwanted Emissions, conducted	0.67	3	dB
All emissions, radiated	3.73	6	dB
Temperature	1	3	°C
Humidity	3.4	5	%
DC and low frequency voltages	2	3	%
Time	1.1	5	%

Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2. Compliance is deemed to occur provided measurements are below the specified limits.