

Digi International

ConnectCore Wi-i.MX51

Report No. DGII0046.3

Report Prepared By



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MPE Estimate



22975 NW Evergreen Parkway
Suite 400
Hillsboro, Oregon 97124

Certificate of Evaluation
Digi International
Model: ConnectCore Wi-i.MX51

Emissions			
Test Description	Specification	Test Method	Pass/Fail
Maximum Permissible Exposure	FCC 2.1091:2012	OET Bulletin 65, Supplement C Ed 01-01	Pass

Approved By:

Donald Facteau, IS Manager

This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government of the United States of America.

Product compliance is the responsibility of the client, therefore the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. This Report may only be duplicated in its entirety. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test.

Revision Number	Description	Date	Page Number
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United States

FCC - Designated by the FCC as a Telecommunications Certification Body (TCB). Certification chambers, Open Area Test Sites, and conducted measurement facilities are listed with the FCC.

A2LA - Accredited by A2LA to ISO / IEC Guide 65 as a product certifier. This allows Northwest EMC to certify transmitters to FCC and IC specifications.

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025. The scope includes radio, ITE, and medical standards from around the world. See: <http://www.nwemc.com/accreditations/>

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European Commission – Validated by the European Commission as a Conformity Assessment Body (CAB) under the EMC directive and as a Notified Body under the R&TTE Directive.

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ACMA - Recognized by ACMA as a CAB for the acceptance of test data.

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Vietnam

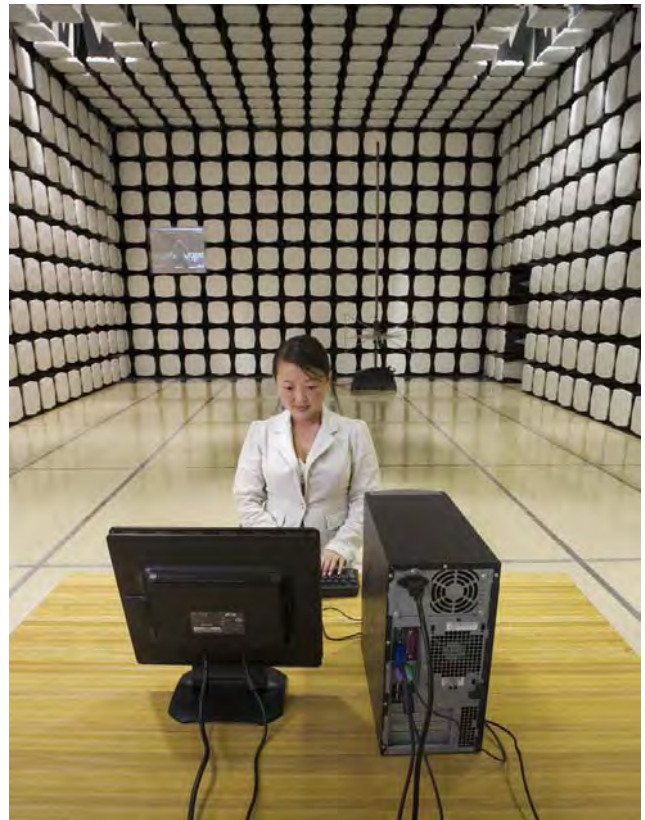
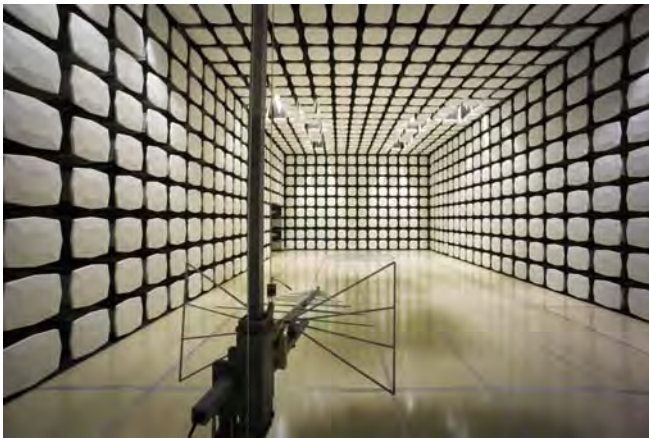
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VCCI				
C-1071, R-1025, G-84, C-2687, T-1658, R-2318	R-1943, G-85, C-2766, T-1659, G-548		R-3125, G-86, G-141, C-3464, T-1634	R-871, G-83, C-3265, T-1511
Industry Canada				
2834D-1, 2834D-2	2834B-1, 2834B-2, 2834B-3		2834E-1	2834C-1



Party Requesting the Evaluation

Company Name:	Digi International
Address:	11001 Bren Road East
City, State, Zip:	Minnetonka, MN 55343
Test Requested By:	Mark Storey
Models:	ConnectCore Wi-i.MX51
Date of Evaluation:	April 19, 2012

Information Provided by the Party Requesting the Evaluation**Functional Description of the EUT (Equipment Under Test):**

802.11 a/b/g/n radio module, FCC ID: MCQ-50M1699 that is seeking a Class II Permissive Change authorization to add a new type of antenna; the Laird Inc. Nanoblade Internal Wireless Device antenna. The omni antenna operates in the 2.4 and 5 GHz bands with a maximum gain in the 2.4 GHz band of 2 dBi, and 4 dBi in the 5 GHz bands.

Objective:

To demonstrate compliance with FCC requirements for RF exposure for 2.1091 mobile devices.

OVERVIEW

Human exposure to RF emissions from mobile devices (47 CFR §2.1091) may be evaluated based on the MPE limits adopted by the FCC for electric and magnetic field strength and/or power density, as appropriate, since exposures are assumed to occur at distances of 20 cm or more from persons. ANSI C95.1-1992 specifies a minimum separation distance of 20 cm for performing reliable field measurements to determine adherence to MPE limits. If the minimum separation distance between a transmitter and nearby persons is more than 20 cm under normal operating conditions, compliance with MPE limits may be determined at such distance from the transmitter. When applicable, operation instructions and prominent warning labels may be used to alert the exposed persons to maintain a specified distance from the transmitter or to limit their exposure durations and usage conditions to ensure compliance. If the use of warning labels on a transmitter is not effective or desirable, the alternative of performing SAR evaluation with the device at its closest range to persons under normal operating conditions may be used. The field strength and power density limits adopted by the FCC are based on whole-body averaged exposure and the assumption of RF field levels relate most accurately to estimating whole-body averaged SAR. This means some local values of exposures exceeding the stated field strength and power density limits may not necessarily imply non-compliance if the spatial average of spatially averaged RF fields over the exposed portions of a person's body does not exceed the limits.

COMPLIANCE WITH 2.1091

"Mobile devices that operate in the Cellular Radiotelephone Service, the Personal Communications Services, the Satellite Communications Services, the General Wireless Communications Service, the Wireless Communications Service, the Maritime Services and the Specialized Mobile Radio Service authorized under subpart H of part 22 of this chapter, parts 24, 25, 26 and 27 of this chapter, part 80 of this chapter (ship earth stations devices only) and part 90 of this chapter are subject to routine environmental evaluation for RF exposure prior to equipment authorization or use if they operate at frequencies of 1.5 GHz or below and their effective radiated power (ERP) is 1.5 watts or more, or if they operate at frequencies above 1.5 GHz and their ERP is 3 watts or more. Unlicensed personal communications service devices, unlicensed millimeter wave devices and unlicensed NII devices authorized under §§15.253, 15.255, and 15.257, and subparts D and E of part 15 of this chapter are also subject to routine environmental evaluation for RF exposure prior to equipment authorization or use if their ERP is 3 watts or more or if they meet the definition of a portable device as specified in §2.1093(b) requiring evaluation under the provisions of that section. All other mobile and unlicensed transmitting devices are categorically excluded from routine environmental evaluation for RF exposure prior to equipment authorization or use, except as specified in §§1.1307(c) and 1.1307(d) of this chapter. Applications for equipment authorization of mobile and unlicensed transmitting devices subject to routine environmental evaluation must contain a statement confirming compliance with the limits specified in paragraph (d) of this section as part of their application."

The EUT will only be used with a separation distance of 20 centimeters or greater between the antenna and the body of the user or nearby persons and can therefore be considered a mobile transmitter per 47 CFR 2.1091(b). Per 47 CFR 1.1310, the EUT meets the General Population / Uncontrolled exposure limits listed in Table 1.

COMPLIANCE WITH FCC KDB 447498 D01 Mobile Portable RF Exposure V04

The system approval is for the host device / WiFi radio combination. One of two different Zigbee radio modules can also be installed (modular approval under FCC ID: MCQ-XBS2C or FCC ID: MCQ-XBPS2C). The WiFi and Zigbee radios are mobile transmitters that each operate through their own antenna. They can transmit simultaneously.

"KDB 447498 D01 Mobile Portable RF Exposure v04" provides the procedures, requirements, and authorization policies for mobile and portable devices. Item #7 best fits the exposure condition described in this report. Since this mobile device is categorically excluded from routine evaluation; per footnotes 1 and 31 of KDB 447498, simple calculations may be used to estimate the power density to demonstrate compliance with 47 CFR 1.1310 requirements. The attached estimate shows MPE limits are met at a 20 cm boundary.

FCC LIMITS FOR MPE**Limits for General Population /Uncontrolled Exposure: 47 CFR 1.1310**

Frequency Range (MHz)	Strength (V/m)	Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minutes)
0.3 - 1.34	614	1.63	*(100)	30
1.34 - 30	824/f	2.19/f	*(180/f ²)	30
30 - 300	27.5	0.073	0.2	30
300 - 1500			f/1500	30
1500 - 100000			1	30

f = frequency in MHz

* = Plane-wave equivalent power density

METHOD OF EVALUATION

The exposure level at a 20 cm distance from the EUT's transmitting antenna is calculated using the general equation:

$$S = \frac{P * G}{4 * \pi * R^2}$$

Where: S = power density (mW/cm²)

P = power input to the antenna (mW)

G = numeric power gain relative to an isotropic radiator

R = distance to the center of the radiation of the antenna (20 cm = limit for MPE estimates)

P*G = EIRP

Solving for S, the maximum power density 20 cm from the transmitting antenna is summarized in the following table:

EUT: ConnectCore Wi.I-MX51	Work Order: DGII0046
Serial Number: none	Date: 04/19/12
Customer: Digi International	Temperature: n/a
Attendees: None	Humidity: n/a
Project: None	Barometric Pres.: n/a
Evaluated by: Greg Kiemel	Power: n/a
	Method
SPECIFICATIONS	
FCC 2.1091:2012	OET Bulletin 65, Supplement C Ed 01-01
COMMENTS	
None	
DEVIATIONS FROM TEST STANDARD	
No Deviations	
	Signature <i>G.K.</i>

MPE Estimates for Individual Devices

Radio	Antenna Type	Antenna Manufacturer	Antenna Part No.	Transmit Frequency (MHz)	Max Peak Conducted Output Power (mW)	Duty Cycle	Duty Cycle Corrected Output Power (mW)	Antenna Gain (dBi)	Minimum Antenna Cable Loss (dB)	Power Density @ 20 cm (mW/cm ²)	General Population Exposure Limit from 1.1310 (mW/cm ²)	Ratio of Power Density to the Exposure Limit
WiFi Radio	Omni	Laird	Nanoblade Internal Wireless	2400	88	1	88	2	0	0.028	1	0.02775
				5250	18	1	18	3.9	0	0.009	1	0.00879
				5600	28	1	28	4	0	0.014	1	0.01399
				5800	26	1	26	4	0	0.013	1	0.01299