



LANTRONIX Open-Q Development Kits User Guide

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Introduction

This document describes the steps that the OEM integrator must follow when designing and manufacturing a system utilizing the Open-Q 845 μ SOM Transmitter Module.

Failing to follow the instructions in this document may invalidate the FCC and IC (Industry Canada) certifications and authorizations of the Module for use in the U.S. and Canada.

The Module certifications described in this document apply only to radio conformance for the Module. The OEM integrator is responsible for all system-level EMI/EMC and Product Safety testing and certifications that apply to the host system in the U.S. and other countries where the system will be marketed or sold.

Applicable Module

Model	USA/FCC	CANADA/IC
Open-Q 845 μ SOM	R68OQ845US	3867A-OQ845US

Additional Regulatory Conformance Testing and/or Submissions Required by the Integrator

- The modular certifications apply to the radio conformance for the Module only.

The OEM integrator is responsible for additional system-level EMI/EMC and Product Safety testing and certification that applies in the U.S. and other countries to the host system containing the Module. This includes but is not limited to Federal Communications Commission (“FCC”) Part 15 Class B Digital Emissions. These system-level EMC tests are to be done with the Module installed and included in the scope of the submission.

- Some of the countries for which modular certifications are provided require additional submissions, authorizations or import permission by the system-vendor or importer. The integrator is responsible for these additional actions.
- Modular radio certification is not possible in some countries. For such countries, OEM integrators must ensure radio certification for the end system is obtained, before placing the product on the market.

Allowable Antennas to use with the Radio Module

The module is certified for use with certain antennas as described in this section.

Allowed Antenna Types:

1. Dipole antenna

Table 1. Allowed Maximum Gain (dBi) Dipole, Including Cable Loss

2.4~2.5GHz	3.32
4.9~5.8GHz	6.11

2. Monopole (chip) antenna (Manufacturer: Fractus Antennas MFG PN: FR05-S1 NO-1-003)

Table 2. Allowed Maximum Gain (dBi) Monopole (chip), Including Cable Loss

2.4~2.5GHz	3.9
4.9~5.8GHz	6.0

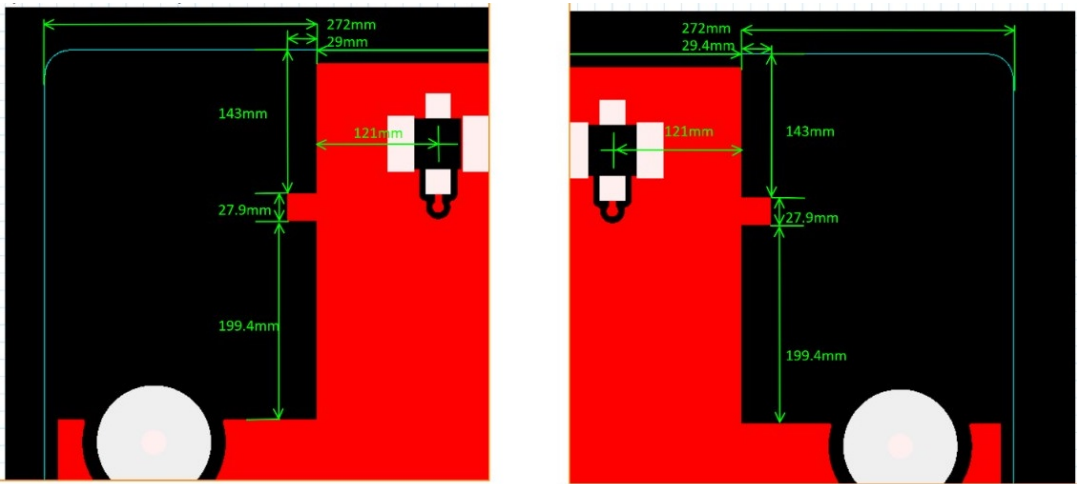
Note 1: The required antenna impedance is 50 ohms. Please see below and the manufacturer antenna design guidelines for details on RF trace routing. Any deviation(s) from the defined parameters of the antenna trace, as described by the instructions below, require that the host product manufacturer must notify the module grantee that they wish to change the antenna trace design.

Note 2: The monopole (chip) antenna is only certified for FCC.

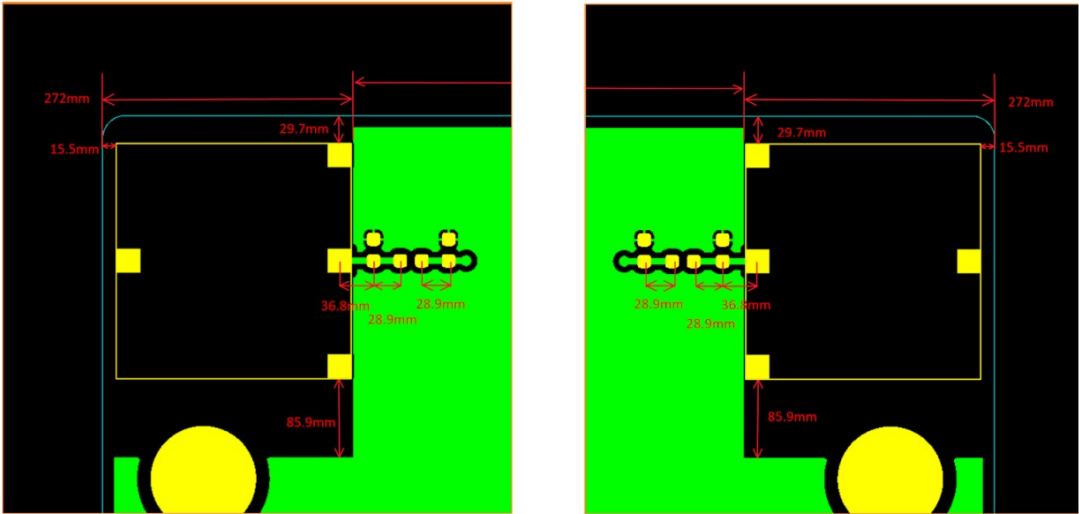
Note 3: See Section 12 of this document for design verification.

Note 5: The antenna cable lengths are 7.9 cm & 10.2 cm

Top (u.FL Connector) Side



Bottom (Antenna) Side



Stack Up:

Lyr	Type	Image	Vendor
✓smt		0.700 mils	
✓L1	Mixed	2.000 mils Dk: 3.86 370HR 1080 (66.0%)	Oak Mitsui
✓L2	Power / Ground	1.200 mils P/G Base Cu: 0.50 oz 1.000 mils HTE 75%	Isola
✓L3	Mixed	2.838 mils Dk: 3.86 370HR 1080 (66.0%)	Oak Mitsui
✓L4	Power / Ground	0.600 mils Dk: 4.14 370HR (1-1652)	Isola
✓L5	Power / Ground	1.300 mils P/G Base Cu: 1.00 oz RTF 75%	Isola
✓L6	Mixed	6.000 mils Dk: 4.14 370HR (1-1652)	Isola
✓L7	Power / Ground	0.600 mils Dk: 3.86 370HR 1080 (66.0%)	Oak Mitsui
✓L8	Mixed	2.700 mils Dk: 3.86 370HR 1080 (66.0%)	Isola
✓smb		2.000 mils Dk: 3.86 370HR 1080 (66.0%)	Oak Mitsui
		0.700 mils	

PCB design guideline

Use of other antenna types or the same type of antenna but with higher gain than listed above is not allowed without additional testing and appropriate FCC or IC approval.

Antenna Placement and RF Safety

The FCC and other countries' regulatory bodies impose strict conditions and limitations on the RF exposure levels

of end products. Acceptable RF exposure levels for this Module depend on transmit power, the location of the transmitting antenna(s) inside the host system and the expected separation of the transmitting antennas to the end user. OEM integrators must take great care to ensure each host system complies with the applicable RF exposure requirements.

The antenna-to-user (bystander) separation distance must be a minimum of 21 cm for FCC and a minimum of 24 cm for ISED.

Failure to adhere to these separation/spacing rules will invalidate the FCC and IC certifications for the Module.

- This separation is measured between the closest point of each transmitting antenna inside the host device to the point of contact by the user or nearby person outside the host device.
- The transmitting antenna cables shall be positioned away from the antenna elements to conform to the configuration tested for compliance.
- When transmitting antennas are installed in the display section of a device, the display section shall not have metallic components and material that can influence or change the operating and RF exposure characteristics of the antennas.
- The separation between the main and aux antennas must be at least 3 cm.
- The transmitter module may not be co-located with any other transmitter or antenna.
- SAR evaluation is required if a separation distance of less than or equal to 20 cm between the user or bystanders and the device antenna cannot always be maintained. For ISED, bystander SAR evaluation is always required for antenna installation in laptop screens per RSS-102 (SPR)-001.

Where one or more of the conditions above cannot be met for a particular host system, additional testing is required to secure the necessary certifications for the system.

Note: These restrictions do not apply to receive-only antenna.

Simultaneous Transmission with other Integrated or Plug-in Radios

The FCC and IC impose conditions and limitations when additional radio(s) are co located in the same host system as the Module with capability to transmit simultaneously. Co-locating other radios such as an integrated or plug in Wireless WAN/cellular radio with the Module requires additional evaluation and possibly submission for authorization from the FCC and IC.

Because the rules are highly dependent on the characteristics of the particular radios that are co-located and simultaneously transmitting, the OEM integrator should seek guidance from a knowledgeable test lab or consultant to determine if additional testing and certification is required. In this case, failure to evaluate and follow the required FCC and IC procedures will invalidate the FCC and IC certifications of the Module and end system.

Module May Not Be Installed by End Users

FCC and IC rules require this Module to be installed in host systems at the factory by the OEM integrator. Thus, end users of the system may not install the Module. Therefore, the host product user instructions must not advise the end user on how to access or remove the Module. Additional FCC authorization/filing is needed to allow end user installation of the radio modules.

If modules are provided to the end users for installation in the host, a two-way authentication protocol is required to limit the module to operate only with the authorized host system.

Required Labeling on the Outside of the Host

FCC Labeling Requirements on the Outside of the Host

The FCC requires a label on the outside of the host system visible to the end user.

Example wording is:

Contains:

FCC ID: R68OQ845US

IC: 3867A-OQ845US

The FCC requires a logo signifying emission compliance on the outside of the host system. The OEM integrator is responsible to perform FCC Part 15 Class B digital emissions testing on the end system with the radio Module installed. The FCC logo below should not be affixed unless the OEM integrator has obtained the necessary Part 15 approval, e.g., self-declaration of conformity.

If the host system is approved to FCC Class B digital emissions limits under a grant of certification issued by a TCB, the FCC ID number shown on the grant should be used on the label instead of the FCC logo **shown in Figure 1 below**.



Figure 1. FCC Logo

Also see <https://www.fcc.gov/logos>.

A certified module has the option to use a permanently affixed label, or an electronic label (Refer to FCC KDB 784748 D02 for e-labelling guidance). All modules without an integrated display on the module must be labelled with a module's FCC ID – Section 2.926.

Industry Canada Labeling Requirements on the Outside of the Host

End Product Labeling

The final end product must be labeled in a visible area with the following for the Open-Q 845 μ SOM:

Contains IC: 3867A-OQ845US.

Required Labeling on the Module

FCC and Industry Canada Labeling on the Module

The OEM integrator must ensure that the FCC ID and IC number is affixed on the Module or in a User/Installation Manual along with other country certification numbers and logos as described herein.

Note: The original Module manufacturer may affix regulatory labeling at time of Module manufacturing. However, the OEM integrator must ensure that Module labeling is complete, correct, and applicable for all the countries to which the host system is to be imported, marketed, or sold.

Required Regulatory Wording for End User Manual / Installation Manual

The OEM integrator must provide instructions in the end user manual how to retrieve the module FCC ID for host devices using electronic labeling (for example an integrated display) in lieu of a physical label or nameplate to meet the labelling requirements of Industry Canada (Refer to FCC KDB 784748 D02 e labeling document for

guidance).

The OEM integrator must include text in the end user manual meeting the regulators' requirements. When the module is installed inside another device, the user manual of that device must contain the statements and warnings below.

FCC Requirements for End User Manual / Installation Manual

FEDERAL COMMUNICATIONS INTERFERENCE STATEMENT

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This device meets all the other requirements specified in Part 15E, Section 15.407 of the FCC Rules.

Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 21 cm between the radiator & your body.

This module is intended for OEM integrators only. Per FCC KDB 996369 D03 OEM Manual v01 guidance, the following conditions must be strictly followed when using this certified module: KDB 996369 D03 OEM Manual v01 rule sections:

List of applicable FCC rules

This module has been tested for compliance to FCC Part 15.247 and 15.407.

Summarize the specific operational use conditions

The module is tested for standalone mobile RF exposure use condition. Any other usage conditions such as colocation with other transmitter(s) or being used in a portable condition will need a separate reassessment through a class II permissive change application or new certification.

Limited module procedures

Not applicable.

Trace antenna designs

See sections 5 and 12 of this document.

RF exposure considerations

This equipment complies with FCC mobile radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 21 cm between the radiator & your body. If the module is installed in a portable host, a separate SAR evaluation is required to confirm compliance with relevant FCC portable RF exposure rules.

Antennas

The following antennas have been certified for use with this module; antennas of the same type with equal or lower gain may also be used with this module. The antenna must be installed such that 21 cm can be maintained between the antenna and users.

Antenna Type:	Flexible Dipole Antenna	Chip Monopole Antenna
Antenna connector:	U.FL	ipex (MHF)

Label and compliance information

The final end product must be labeled in a visible area with the following: “Contains FCC ID: R68OQ845US”. The grantee’s FCC ID can be used only when all FCC compliance requirements are met.

Information on test modes and additional testing requirements

This transmitter is tested in a standalone mobile RF exposure condition and any co located or simultaneous transmission with other transmitter(s) or portable use will require a separate class II permissive change reevaluation or new certification.

Additional testing, Part 15 Subpart B disclaimer

This transmitter module is tested as a subsystem and its certification does not cover the FCC Part 15 Subpart B (unintentional radiator) rule requirement applicable to the final host. The final host will still need to be reassessed for compliance to this portion of rule requirements if applicable.

As long as all conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

IMPORTANT NOTE: In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid, and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for reevaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

Manual Information to the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user’s manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.

OEM/Host manufacturer responsibilities

OEM/Host manufacturers are ultimately responsible for the compliance of the Host and Module. The final product must be reassessed against all the essential requirements of the FCC rule such as FCC Part 15 Subpart B before it can be placed on the US market. This includes reassessing the transmitter module for compliance with the Radio and EMF essential requirements of the FCC rules. This module must not be incorporated into any other device or system without retesting for compliance as multi-radio and combined equipment.

INDUSTRY CANADA STATEMENTS

This device complies with ISED's license-exempt RSSs. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Radiation Exposure Statement:

This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 24 cm between the radiator & your body. This device is intended only for OEM integrators under the following conditions: (For module device use)

1. The antenna must be installed and operated with a minimum distance of 24 cm between the antenna and users, and
2. The transmitter module may not be co-located with any other transmitter or antenna.

As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

IMPORTANT NOTE:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the Canada authorization is no longer considered valid and the IC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate Canada authorization.

End Product Labeling

This transmitter module is authorized only for use in device where the antenna may be installed and operated with minimum distance of 24 cm between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains IC: 3867A-OQ845US".

Manual Information to the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as shown in this manual.

CE Requirements for End User Manual / Installation Manual

This device complies with Directive 2014/53/EU issued by the Commission of the European Community. A minimum separation distance of 20 cm must be maintained between the user's body and the device, including the antenna during body-worn operation to comply with the RF exposure requirements in Europe.

Frequency bands

2.4 GHz Wi-Fi Frequencies 11b/g/n/ac 20MHz: 2412 – 2472 MHz, 13 Channels

2.4 GHz Wi-Fi Frequencies 11n/ac 40MHz: 2422 – 2462 MHz, 9 Channels

BT/BTLE (2402 ~ 2480 MHz) Number of BT Channels: 79 BTFHSS (CH0-78), 40 CH BTLE

5180-5240 MHz Wi-Fi

5 GHz (11a, 11n, 11ac) 20MHz: 5180-5240MHz, 4 Channels (36, 40, 44 and 48)

5 GHz (11n, 11ac) 40MHz: 5180-5240MHz, 2 Channels (38 and 46)

5 GHz (11ac) 80MHz: 1 Channels (CH 42)

5260-5320 MHz Wi-Fi

5 GHz (11a, 11n, 11ac) 20MHz: 5260-5320MHz, 4 Channels (52, 56, 60 and 64)

5 GHz (11n, 11ac) 40MHz: 5260-5320MHz, 2 Channels (54 and 52)

5 GHz (11ac) 80MHz: 1 Channels (CH 58)

5500-5700 MHz Wi-Fi

5 GHz (11a, 11n, 11ac) 20 MHz, 11 Channels (100, 104, 108, 112, 116, 120, 124, 128, 132, 136 and 140).

5 GHz (11n, 11ac) 40MHz, 5 Channels (102, 110, 118, 126 and 134)

5 GHz (11ac) 80MHz, 2 Channels (106 and 122)

Powers

Transmit Mode	Maximum Average EIRP (dBm)	
	CDD	Beamforming
2.4 GHz		
802.11b	18.23	N/A
802.11g	19.61	N/A
802.11ac (VHT20)	19.43	19.98
802.11ac (VHT40)	19.50	19.86
5 GHz		
802.11a	20.94	N/A
802.11ac 20 MHz	21.69	21.69
802.11ac 40 MHz	22.80	22.80
802.11ac 80 MHz	22.83	22.83
Bluetooth Basic Rate	9.90	N/A
Bluetooth (EDR)	8.09	N/A
Bluetooth 4.0	9.98	N/A
Bluetooth 5.0	9.58	N/A

WLAN 5 GHz

Operations in the 5.18-5.24 GHz and 5260-5320 GHz frequency are restricted to indoor usage in all member states.



AT	BE	BG	CH	CY	CZ
DE	DK	EE	EL	ES	FI
FR	HR	HU	IE	IS	IT
LI	LT	LU	LV	MT	NL
NO	PL	PT	RO	SE	SI
SK	TR	UK			

Integrator

Important Note: SOMs are configured from the factory for FCC compliance, so are not CE compliant. To ensure CE compliance, please contact Lantronix Technical Support for the files and instructions on how to reconfigure devices destined for sale in Europe.

In all cases assessment of the final product must be compliance with the Essential requirements of the Directive 2014/53/EU Articles 3.1(a) and (b), safety and EMC respectively, as well as any relevant Article 3.2 requirements.





Antenna Gain (WLAN & BT):

Parameter	Specification
Manufacturer	Taoglas
Part Number	FXP.830.07.0100C
Peak Gain (on plastic*)	2.4GHz: 3.32dBi, 5.8GHz: 6.11dBi
Average Gain (on plastic*)	2.4GHz: -3.0dBi, 5.8GHz: -0.7dBi
Impedance	50 ohms
Type	Flexible Dipole Antenna
Polarization	Linear
VSWR (free space)	<4.5:1, 2400 – 2480, <2.25:1, 4900 – 5800
Frequency	2.4 ~ 2.5GHz, 4.9 ~ 5.8GHz
Size	42mm x 7mm x 0.1mm
Antenna Color	Black with green logo and text
Antenna Body Material	Polymer
Adhesive	3M double-sided tape
Connector Height	U.FL: 2.5mm Max.
Cable	Gray 100mm 1.37 co-axial
Operating Temp	-40 to +85 C

Europe – EU Declaration of Conformity (Open-Q 845 μ SOM)

Hereby, Lantronix, declares that this Open-Q 845 μ SOM is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

Declaration of Conformity

	
	
EU DECLARATION OF CONFORMITY	
Certificate no. 212140564/AA/00	
Manufacturer's Name:	Lantronix, Inc.
Manufacturer's Address:	7535 Irvine Center Drive, Suite 100 Irvine, CA. 92618. USA
Product Type:	Open-Q 845 μ SOM
Product Family:	Open-Q 845 μ SOM
Rated:	SOM_SYS_PWR/-0.3 - 6 VDC, USB_VBUS/-0.3 - 28 VDC
Intended use:	Commercial installations, indoor use
Manufacturer's Quality System:	
	
ISO 9001:2015 Certificate No. 74 300 4282 TUV Rheinland	
Applicable EU Directives:	
Low Voltage Directive (2014/35/EU)	
• EN 62368-1:2014 + A11:2017	
EMC Directive (2014/30/EU)	
• EN 301 489-1 V2.2.3 (2019-11) • EN 301 489-17 V3.1.1 (2017-02) • EN 55032:2015 +A11:2020, Class B • EN 61000-4-2:2009 • EN 61000-4-3:2006 +A1:2008 +A2:2010	
RF Radio Directive (2014 / 53 / EU)	
• EN 300 328 V2.2.2 (2019-07) • EN 301 893 V2.1.1 (2017-05)	
EU Directive 2011/65/EU for Restriction of Hazardous Substance (RoHS2) with exemption 7(c)-I	
Statement of Conformity: The product specified above complies with applicable EU directive referenced, including the application of sound engineering practice.	
Signature: 	Date: <u>August 23, 2021</u>
Name: <u>Fathi Hakam</u>	Title: <u>VP of Engineering</u>
CERT-00217 rev A	

OEM Integrator Checklist

The OEM Integrator will integrate the Module in the host systems in accordance with the instruction specified in this document and the documents referenced herein.

- The OEM Integrator will ensure the Module is integrated in a host system using only antennas that are of the same type and having equal or less antenna gain as described in this document.
- The OEM Integrator will ensure the antenna placement inside the host system will maintain the required spacing to the end user for RF Exposure compliance, as specified in this document.
- If other radios are integrated inside the host with the Module, the OEM Integrator will contact a test lab or TCB

to determine if additional FCC compliance evaluation is required to meet FCC collocation rules.

- The OEM Integrator will ensure end user documentation will contain the specified regulatory wording and ensure the host system and the Module itself is labeled as specified in this document.
- The OEM Integrator will ensure that nothing is done that will change the transmit power level of the module.
- The OEM Integrator will ensure end user documentation will contain clear instructions on how to access the FCC ID and IC Number of the module should an electronic display (e labeling) be used to meet the FCC and IC labeling requirements (Refer to FCC KDB 784748 D02 e labeling document and IC Notice 2014-DRS1003 for guidance).
- The OEM Integrator will ensure end user documentation will contain clear instructions on how to access the FCC ID and IC Number of the module should an electronic display (e labeling) be used to meet the FCC and IC labeling requirements (Refer to FCC KDB 784748 D02 e labeling document and IC Notice 2014-DRS1003 for guidance).
- The Open-Q 845 μ SOM is a pre-certified Wi-Fi/BT module that requires specific binary files for WLAN and BT, and a WLAN configuration file to maintain compliance. The correct binary files for WLAN and BT along with the WLAN configuration file are included with the Android releases from Lantronix (as indicated in the software release notes). Customers programming the SOM with other OS images must contact Lantronix to ensure they have incorporated the correct files to maintain compliance.
- For Open-Q 845 μ SOMs intended for sale in Europe, please ensure that it has been reconfigured for Europe as default configuration is for FCC and will not be CE complaint. Please contact Lantronix Technical Support for the instructions on how to configure for Europe.
- For Open-Q 845 μ SOMs using the monopole chip antenna in section 5, please contact Lantronix Technical Support for the instructions on how to configure for this antenna. Spot Check is required to ensure product meets the FCC Part 15 standards. Customer should specify all RF trace impedance as 50 Ω (+/- 5 Ω) using controlled impedance PCB fabrication. After assembly, customer should measure TX power, sensitivity, and any unwanted signal from surrounding circuit couple into the radio path using a spectrum analyzer. If unwanted coupling detected, distance between RF path and surrounding circuit may needs to be re-routed.

Contacts

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Lantronix Technical Support

<http://www.lantronix.com/support>

Sales Offices

For a current list of our domestic and international sales offices, go to the Lantronix web site at

<http://www.lantronix.com/about-us/contact/>.



Documents / Resources

LANTRONIX



Open-Q 845 μ DOM Wi-Fi/BT Certification
ODM Integrator Guide
Revision 1.0 (2016-08-01)
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OQ845US, R68OQ845US, Open-Q Development Kits, Development Kits, Open-Q Development, Open-Q

Manuals+.