

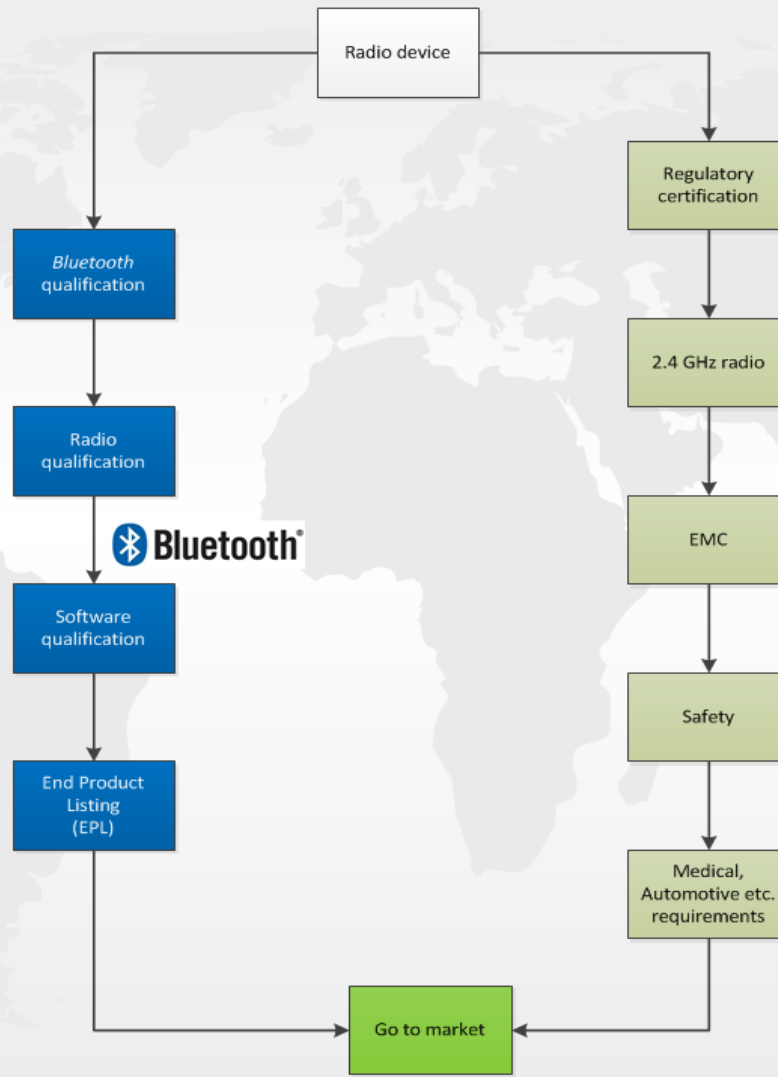


Bluetooth®, Wi-Fi® and Regulatory Certifications

Table of Contents

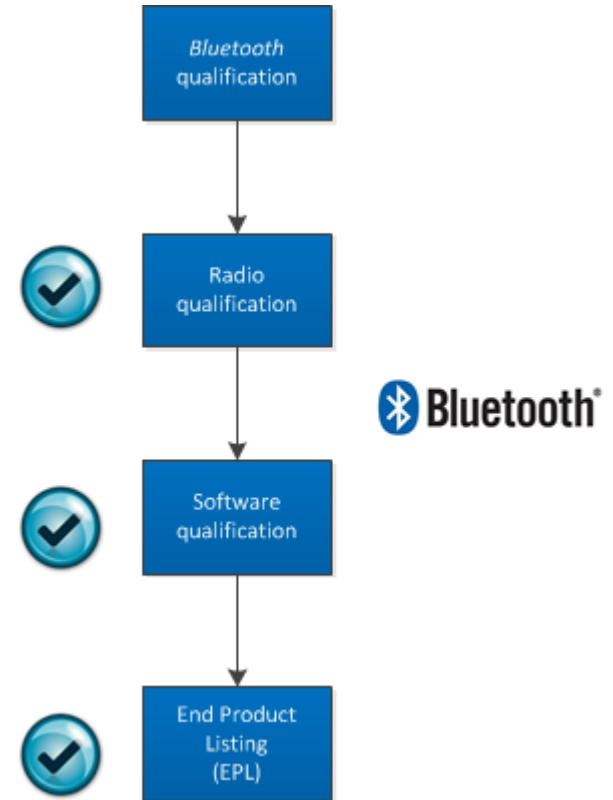
- Qualification Process Overview
- *Bluetooth* Qualification
- Wi-Fi qualification
- CE Certification
- FCC and IC Certification
- Japan Certification
- Steps for Regulatory Compliance
- Other Markets
- Costs
- Summary

Qualification Process Overview



Bluetooth Qualification Process

- **All *Bluetooth* products must be qualified**
 - Verify conformance
 - Promote interoperability
 - Grant IP license
 - Recognize members
 - Logo and word mark usage rights
- **Consists of three steps**
 - Radio (hardware) qualification
 - *Controller Subsystem*
 - Software (stack) qualification
 - *Host Subsystem*
 - End product listing
 - *Controller Subsystem* combined with *Host Subsystem*



- **Purpose to verify the radio's conformance to *Bluetooth* specification**
 - Radio testing at Bluetooth Qualified Test Facility
 - AT4 wireless
 - SGS
 - UL
 - Etc.
 - Obtaining QDID from Bluetooth SIG
 - Component or subsystem listing



Bluetooth Qualification Process

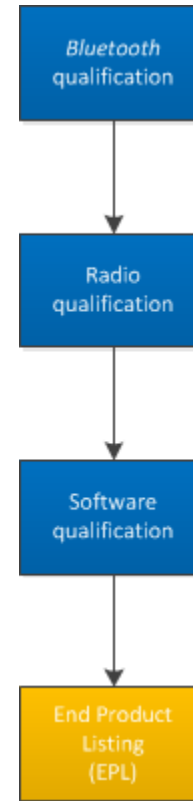
- Purpose to verify the *Bluetooth* stack's conformance to *Bluetooth* specification
 - Protocol testing at a Bluetooth Qualified Test Facility (or Profile Tuning Suite, PTS)
 - RFCOMM
 - L2CAP
 - AVDTP
 - etc.
 - Profile testing at a Bluetooth Qualified Test Facility(or PTS)
 - SPP
 - A2DP
 - AVRCP
 - etc.
 - Obtaining QDID from Bluetooth SIG
 - Component or Subsystem listing



Bluetooth Qualification Process

- Combining the Subsystems to an end product
- End products can be sold as is without limitations of the *Bluetooth* license
- End products represent a complete *Bluetooth* wireless solution
- Typically a combination of two (*or three*) Subsystems:
 - A *Bluetooth* Controller Subsystem (radio and HCI)
 - A *Bluetooth* Host Subsystem (protocols and profiles)
 - *Profile Subsystem (profiles)*

See: [Bluetooth End Product Listing Guide](#)

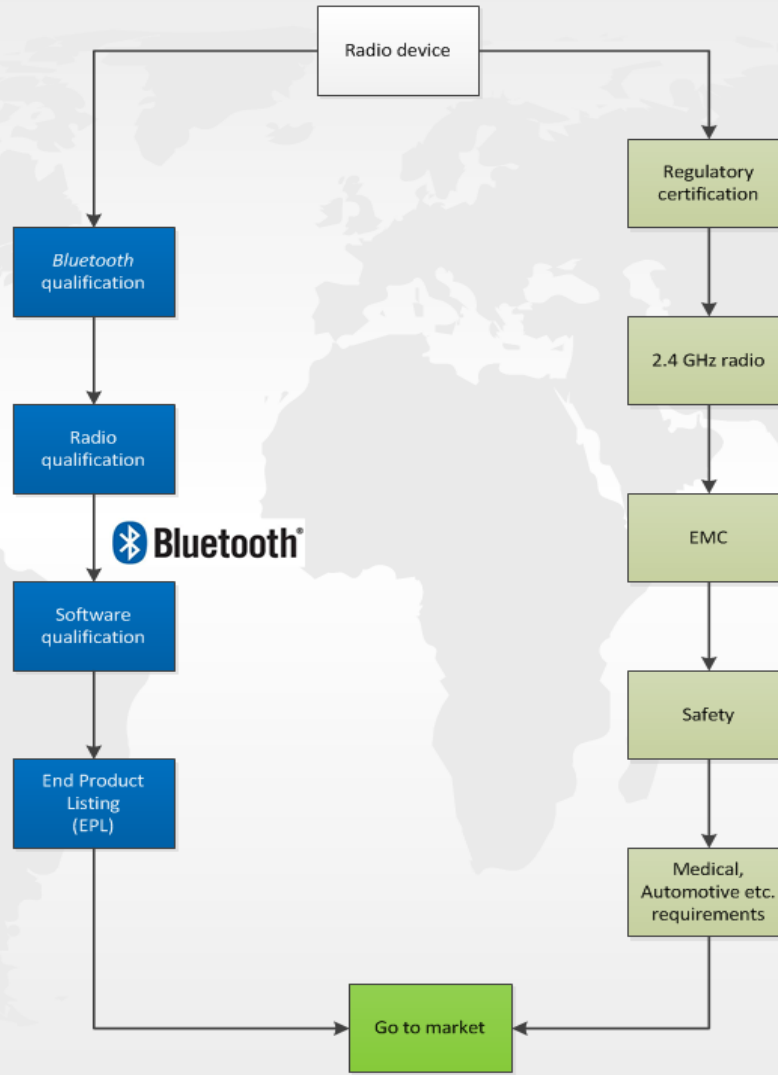


Wi-Fi Qualification Process

- **Wi-Fi qualification is optional unlike *Bluetooth***
- **Qualification consist of core programs and optional parts**
 - Core programs such as : 802.11 b/g/n/ac WPA2, etc.
 - Optional programs such as: Miracast, Wi-Fi Direct etc.
- **Wi-Fi qualification, just like *Bluetooth* is used to**
 - Improve interoperability
 - Promote interoperability
 - Logo and word mark usage rights
- **Consists of three steps**
 - Join the [Wi-Fi Alliance](#)
 - Test the product at an [Authorized Test Lab](#)
 - Listing the product on the [Wi-Fi Alliance website](#)



Regulatory Certifications



Regulatory Certifications

- **Market and application specific certification requirements**

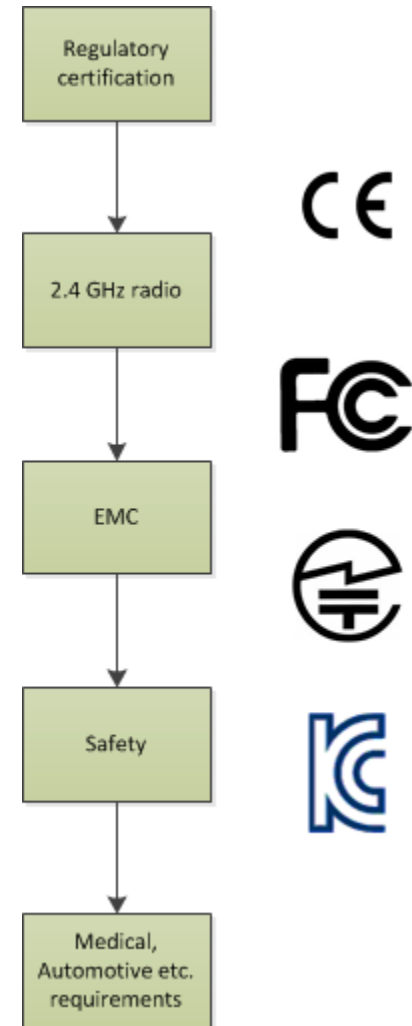
- Europe: CE
- USA: FCC
- Canada: Industry Canada
- South-Korea: KCC
- Japan : Telec
- Australia : C-tick
- etc.

- **Typically split into three separate categories**

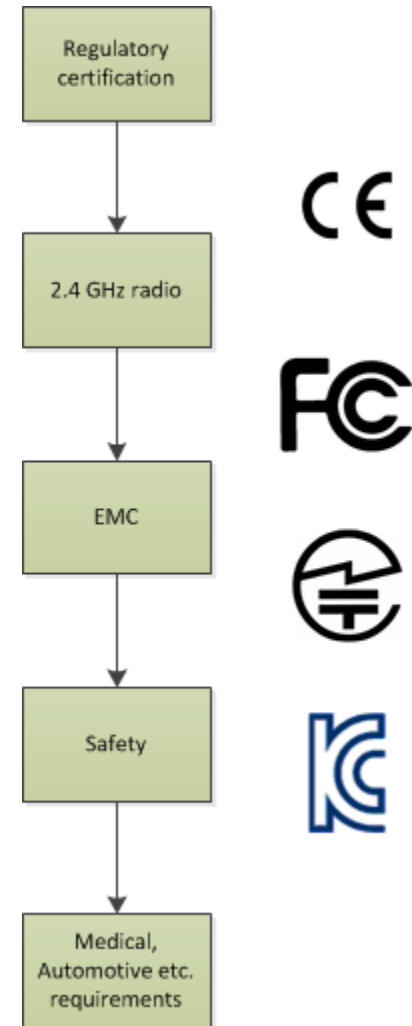
- RF
- EMC
- Safety

- **Application specific requirements**

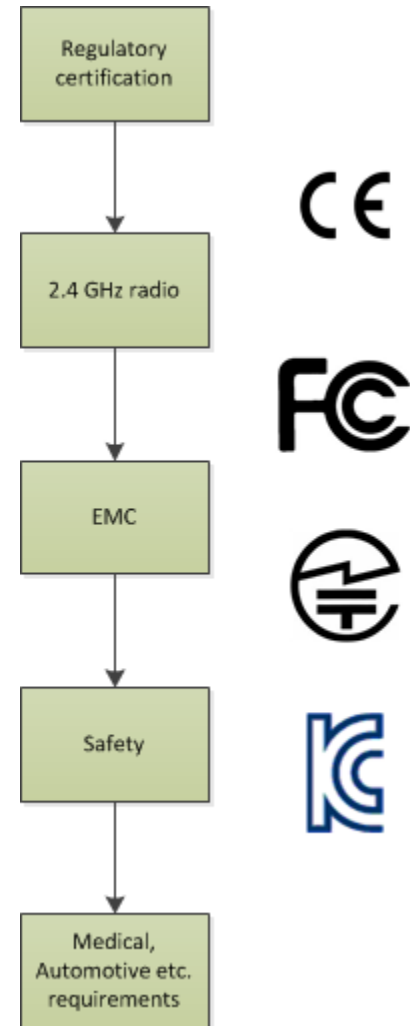
- Medical
- Automotive
- Aviation
- etc.



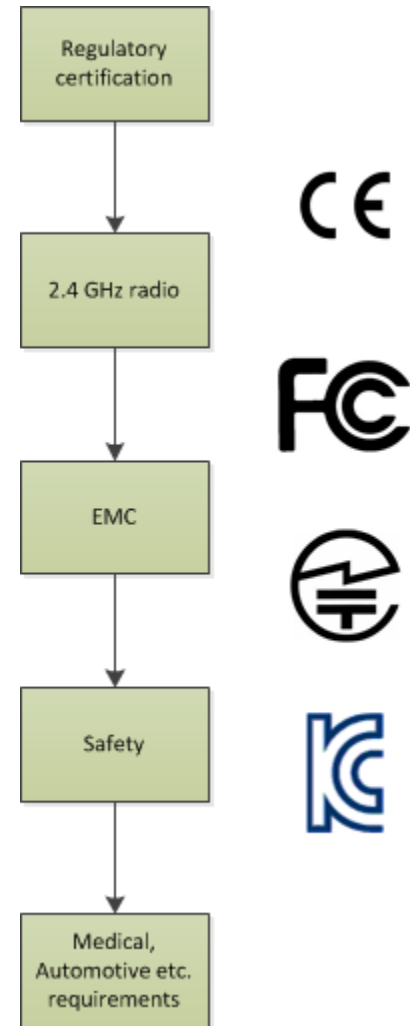
- Declaration from a manufacturer that he product meets the requirements of the R&TTE directive
- The manufacturer of the end product is responsible for the product being compliant
- Relevant standards for a product implementing a 2.4GHz radio
 - RF EN300328 (radio emissions)
 - EMC EN301489 (other emissions and immunity)
 - Safety EN60950



- **TX power level is higher than 13 dBm (20 mW)**
 - RF exposure needs to be evaluated
 - Might require SAR (Specific Absorption Rate) testing
 - Depends on end products use case
 - Close to human body
 - etc.
- **Multiple radios used in the end product**
 - If co-located radios are NOT transmitting simultaneously - RF exposure and emissions can be considered independently for each radio.
 - If the radios transmit simultaneously, RF exposure must be evaluated

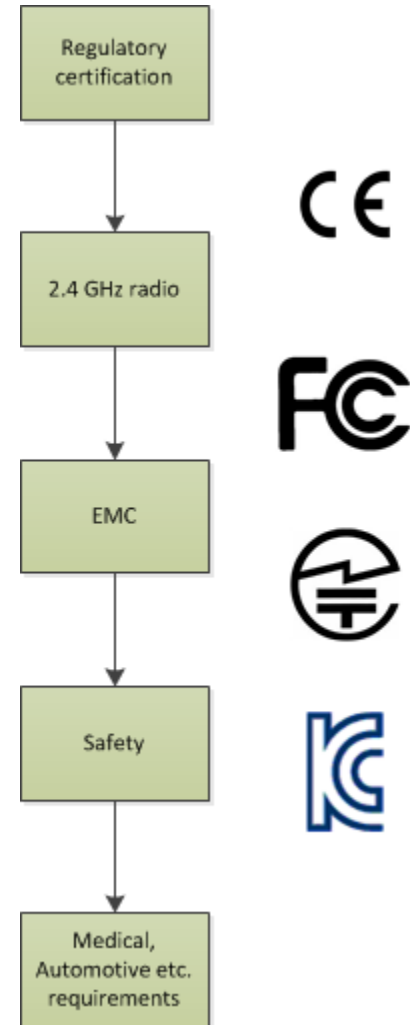


- All Bluegiga products have been tested for CE
 - EN300328
 - EN301489-1/17
 - DoC are available
 - Test reports are available
- For the end product, all the conducted test cases of EN300328 can be inherited from the modules test report.
- Any radiated test cases or ESD under EN300328 and EN301489 must be tested with the end product
- RF exposure evaluation depends on the application and the TX power of the module

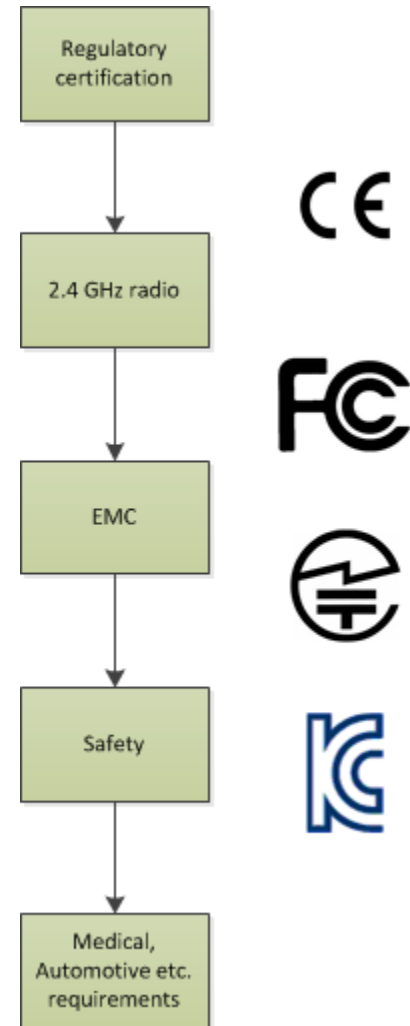


North America: FCC and IC

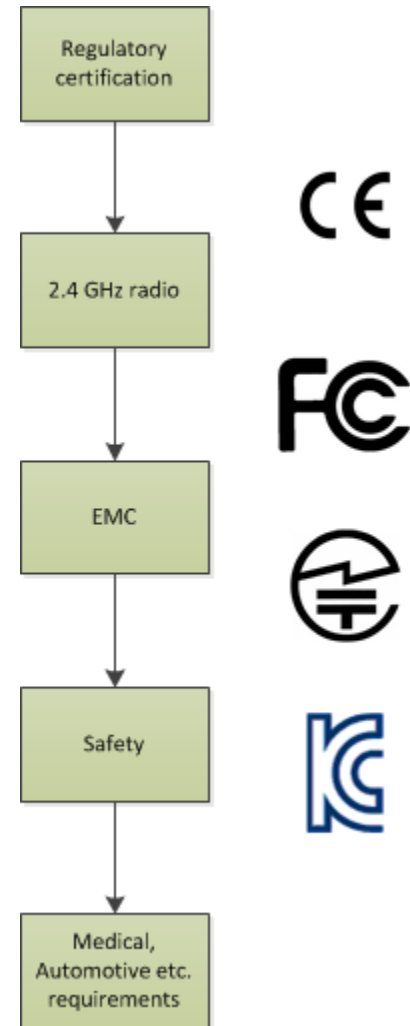
- **Types of authorisation**
 - Certification (radio)
 - DoC (computer peripheral)
 - Verification (other electronic devices)
- **Modular certification**
 - End product using a modular certified radio will not need radio certification provided that the restrictions mentioned in the modules grant are met
- **Relevant standards for a product implementing a 2.4GHz radio**
 - Radio FCC Part 15C
 - Unintentional radiators FCC Part 15B
 - CPU, memories etc.
- **Class 1 Permissive Change (C1PC)**
 - Changes that do not increase emissions (f.ex small BOM change)
 - Does not need application to FCC
- **Class 2 permissive change (C2PC)**
 - Changes that increase emissions (different type of an antenna, colocation, RF layout change)
 - Must be applied from FCC



- The RF exposure rules of FCC are described in KDB 447498 ([link](#))
- Any restrictions mentioned in the FCC grant must be followed. To remove the restrictions Class 2 Permissive Change will be required.
- For IC the threshold for RF exposure evaluation is 20 mW

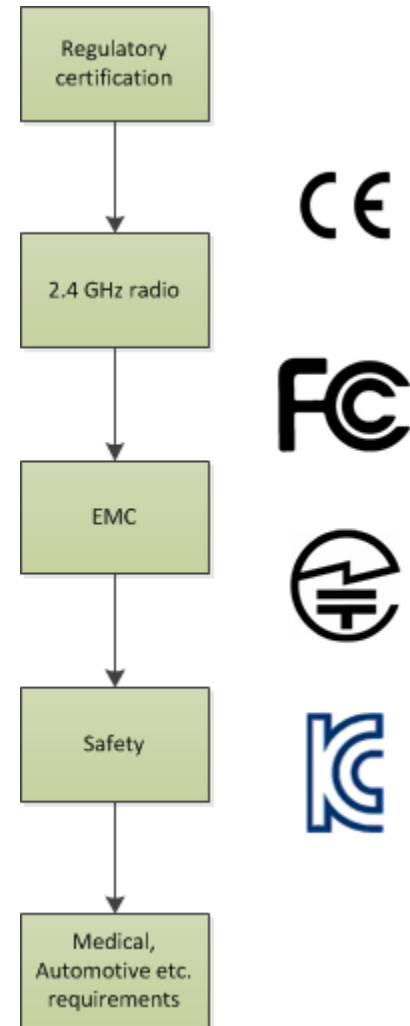


- **All Bluegiga products have been tested for FCC and IC**
 - Products have unique FCC and IC IDs
 - The grants are available
 - Test reports are available
- **End users can reuse the FCC ID and test reports if radio co-location rules can be obeyed**
 - Instructions in product data sheets
- **SAR may need to be evaluated based on used module and end product use case**



Japan: Telec (ARIB STD-T66)

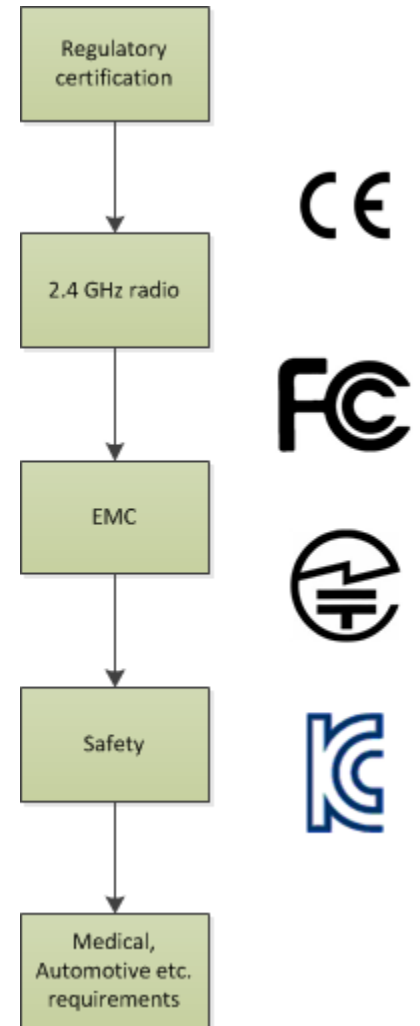
- All Bluegiga products have MIC Japan type approval and have been tested according to ARIB STD-T66
 - Test reports are available
 - The certificates are available
- Modular qualification for SMD modules was not possible earlier, but the rules changed during 2012 and now modular approval for SMD products is possible – Bluegiga products have been updated
- End customers can reuse the modular approval of Bluegiga products



- **Countries following the FCC standards**
 - Anguilla
 - American Samoa
 - Bolivia
 - Cayman Islands
 - El Salvador
 - Federated States of Micronesia
 - Guam
 - Guatemala
 - Marshall Islands
 - Northern Mariana Islands
 - Palau
 - Panama
 - Puerto Rico
 - Virgin Islands (US)

- **Countries following the CE standards**
 - EU countries
 - ETFA countries – Iceland, Norway, Switzerland (and Liechtenstein)
 - French DOMs
 - Guadeloupe, Martinique, French Guiana, Reunion
 - Faroe Islands, Greenland, Svalbard, Azores, Madeira, Canary Islands, Guernsey, Jersey, Isle of Man, Montserrat, Pitcairn Islands
 - Afghanistan
 - Andorra
 - Georgia
 - Gibraltar
 - Maldives
 - Monaco
 - San Marino
 - Sao Tome and Principe
 - Seychelles
 - Vatican City

- **Typically local regulation and test cases exist**
 - These vary depending on the country
 - In most cases additional testing is needed
- **Testing effort and costs need to be evaluated based on the market**



Steps for Regulatory Compliance

- **Europe: CE**

- Contact an accredited test laboratory for CE testing services.
- EN300328 Conducted test cases can be inherited from the modules test report.
- All radiated test cases of EN300328 and EN30189 must be tested with the end product in an accredited test laboratory.
- Safety / RF exposure (if needed) must be tested with the end product in an accredited test laboratory.
- Based on the test reports write a Declaration of Conformity. The person who signs the signature must be traceable and the test reports with the technical information must be saved in a Technical Construction File .
- Label the end product with the CE logo.

- **North America: FCC/IC**

- Read the FCC grant and the FCC info in the datasheet of the module if there are any restrictions that must be taken into account with the end product.
- If there aren't any restrictions that concern the end product, the labeling of the end product with "Contains FCC ID: QOQ...." is all that is needed.
- If there are any restriction that do concern the end product (co-location or RF exposure limit), contact your local test laboratory for services to remove the restrictions.

- **Japan / Korea**
 - No further RF testing is needed when using a certified module in Japan or South-Korea.
- **Australia / New Zealand**
 - Contact your local representative / importer. The local representative or importer is responsible for the compliance and holds the evidence.
 - CE test reports cannot be used as an evidence of compliance but they can be used for generating the official test reports based on ACMA standards.



Costs

Costs : Bluetooth

Category	Item	Cost
Regulatory certification cost	CE	\$7 900
	FCC	\$7 900
	IC	\$7 900
	Japan	\$8 600
	Korea	\$4 500
	Australia	\$4 500
Bluetooth qualification cost	Bluetooth RF	\$18 520
	Bluetooth SW	\$17 500
	End product listing	\$10 000
Equipment cost	Testing equipment	\$57 500
Total costs		\$144 820,00
Annual volume	50000 pcs	
Cost per unit		\$2,90

ALSO: 3-6 months of work

Equipment cost

Profile Tuning Suite (PTS)	\$7 500
Bluetooth sniffer	\$15 000
Bluetooth analyzer	\$15 000
Spectrum analyzer	\$20 000

Total

\$57 500

Costs : Wi-Fi

Category	Item	Cost
Regulatory certification cost	CE	\$7 900
	FCC	\$7 900
	IC	\$7 900
	Japan	\$8 600
	Korea	\$4 500
	Australia	\$4 500
Wi-Fi qualification cost	Alliance membership / annual	\$15 000
	Testing	\$10 000
Equipment cost	Testing equipment	\$40 000
Annual volume		50 000 pcs
Cost per unit		\$2,04

ALSO: 3-6 months of work

Equipment cost

IOP equipment	\$5 000
Wi-Fi analyzer	\$15 000
Spectrum analyzer	\$20 000

Total **\$40 000**

- **All Bluegiga *Bluetooth* modules are qualified**
 - Typically only End Product Listing (EPL) is needed for the end customer
 - EPL is free of charge
 - Instructions how to make an EPL can be found from Tech Forum
- **All Bluegiga products have CE, FCC and IC certifications**
 - Reduce testing time and cost for end product manufacturer
 - Test reports can be reused
 - However need to evaluate radio co-location and RF exposure
- **Most Bluegiga products have Japan and South-Korea qualifications**
 - Updates are being made due to regulation changes
- **Significant money and time savings for end users**
 - \$100-150k+ cost savings
 - 3-6 months faster time-to-market



Thank You

