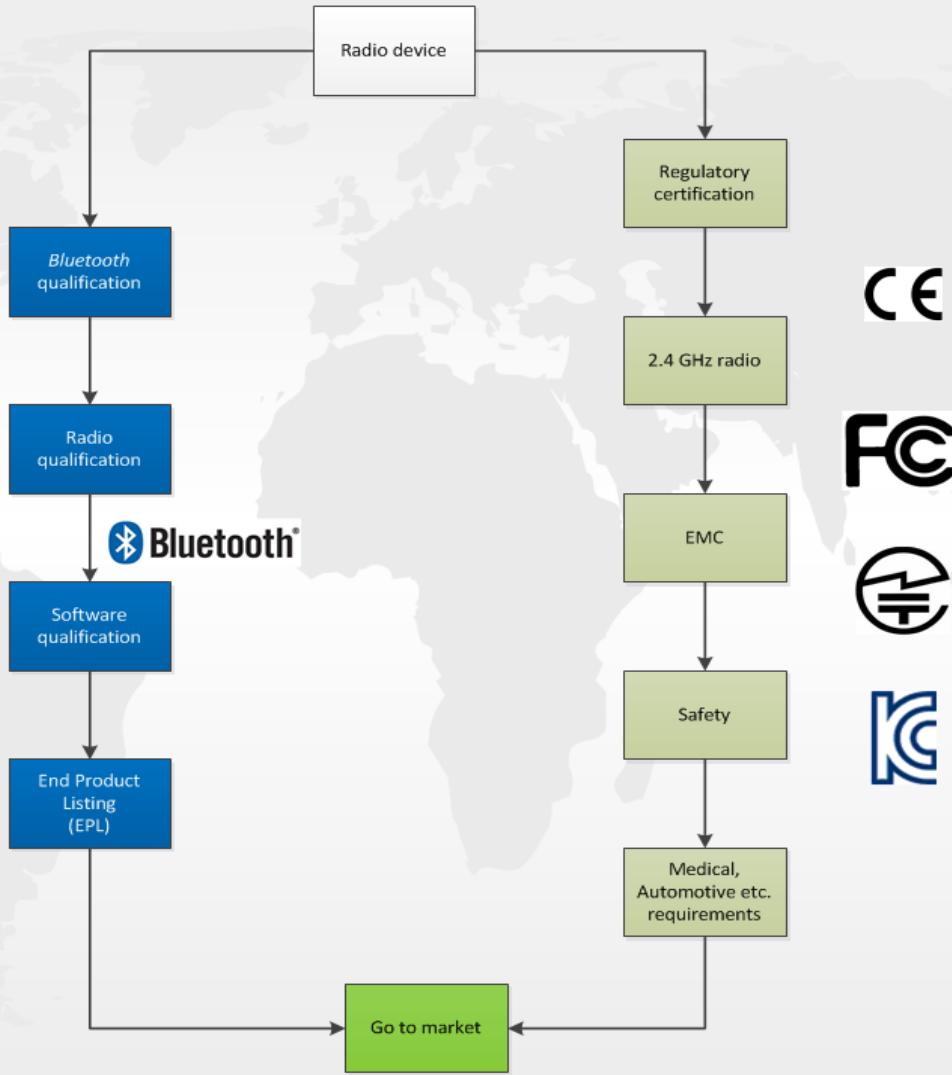


## *Bluetooth®, Wi-Fi® and Regulatory Certifications*

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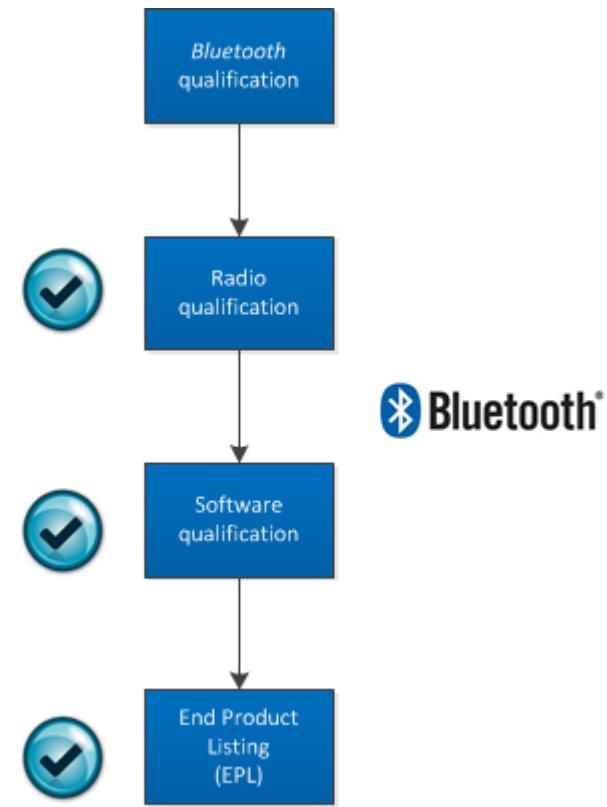
- Qualification Process Overview
- *Bluetooth* Qualification
- Wi-Fi qualification
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- FCC and IC Certification
- Japan Certification
- Steps for Regulatory Compliance
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# Qualification Process Overview



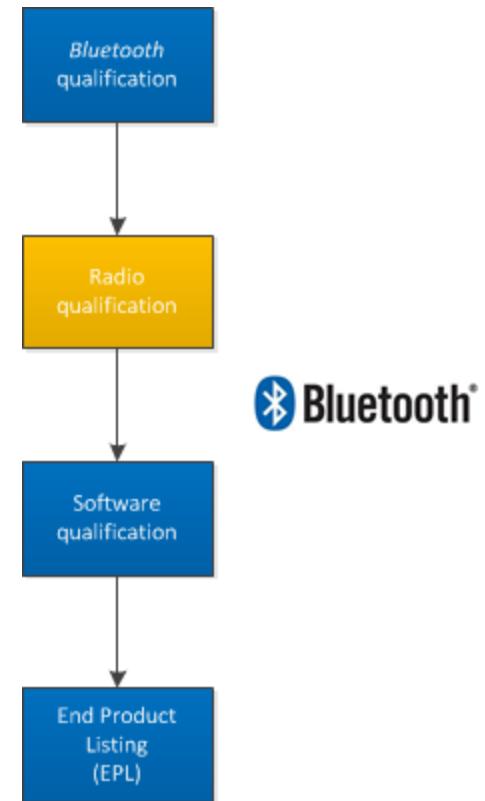
# Bluetooth Qualification Process

- 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*



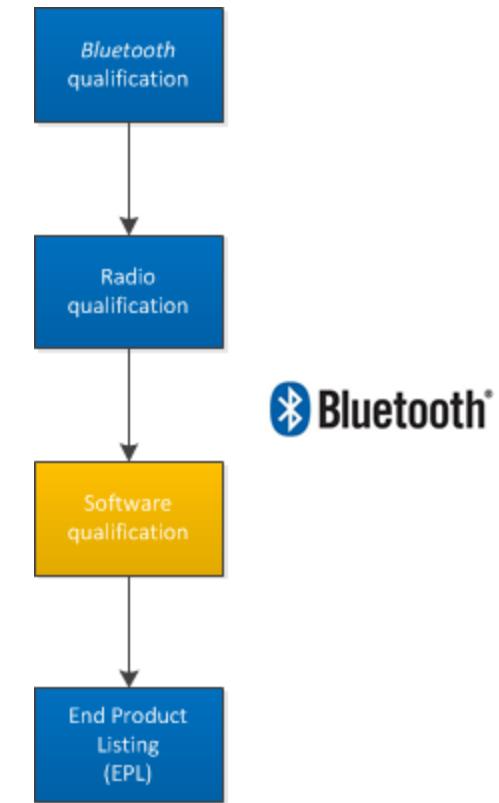
# Bluetooth Qualification Process

- 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



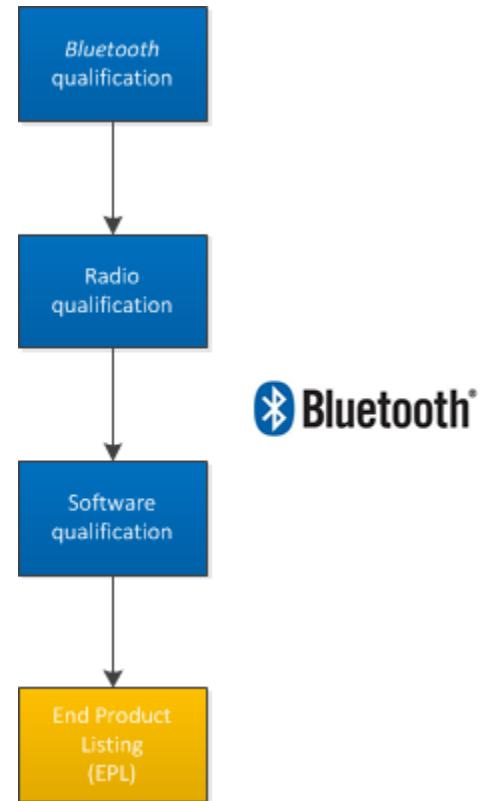
# Bluetooth Qualification Process

- 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)*



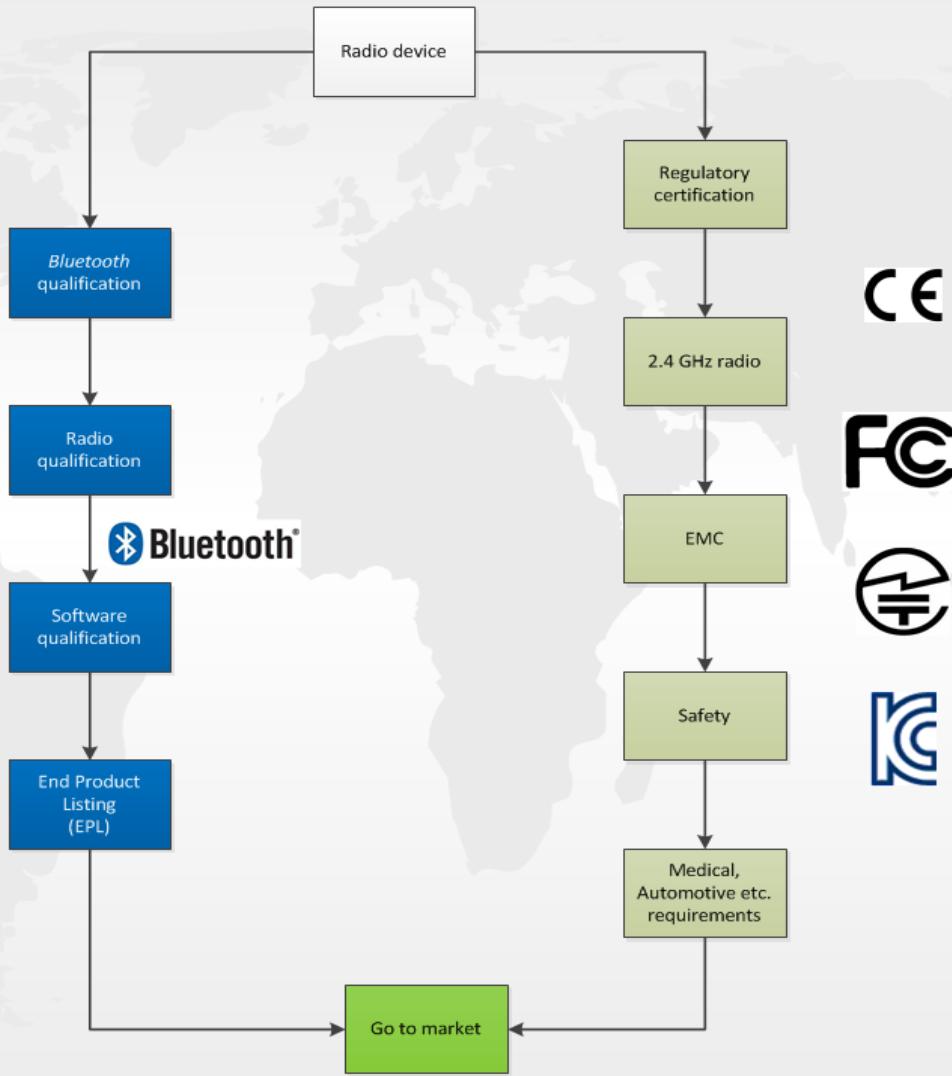
See: [\*\*Bluetooth End Product Listing Guide\*\*](#)

# 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



CE

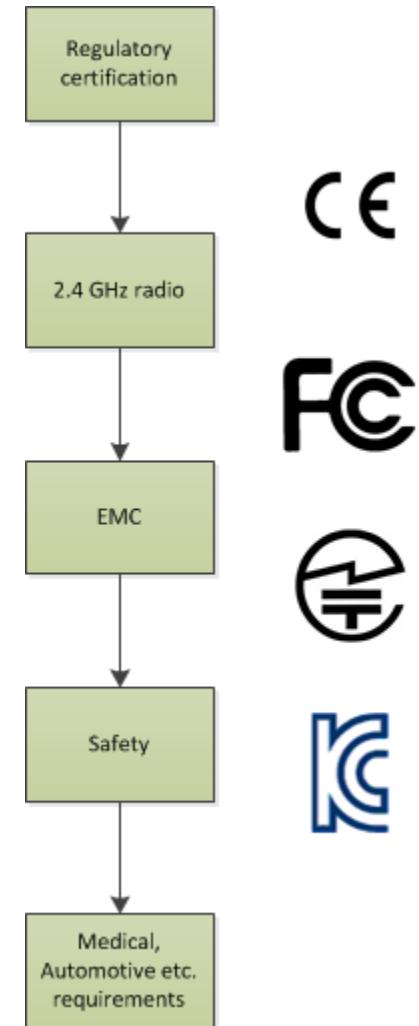
FCC

IC

KC

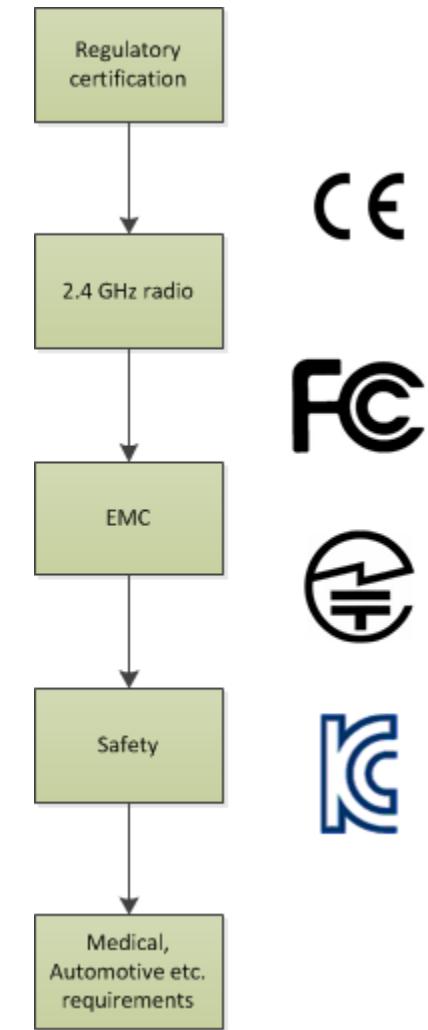
# Regulatory Certifications

- 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.

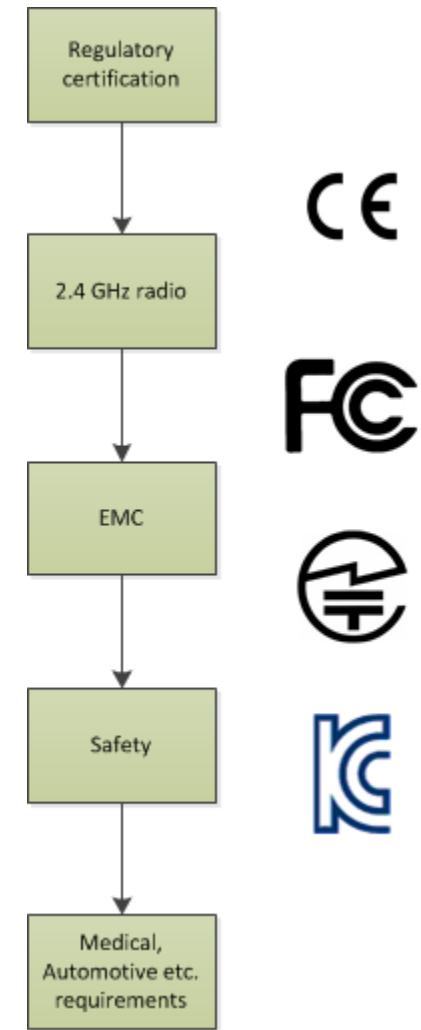


# Europe: CE

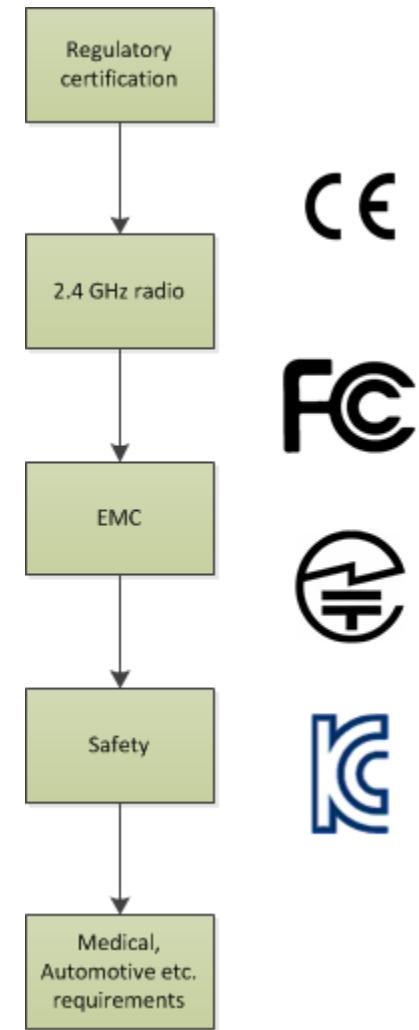
- Declaration from a manufacturer that he product meets the requirements of the R&TTE directive
- The manufacturer of the end product is responsible for the product being compliant
- Relevant standards for a product implementing a 2.4GHz radio
  - RF EN300328 (radio emissions)
  - EMC EN301489 (other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

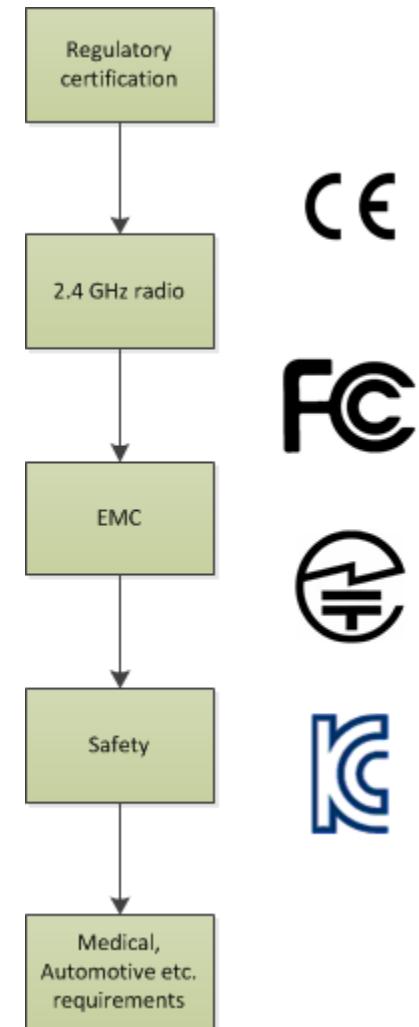


- All Bluegiga products have been tested for CE
  - EN300328
  - EN301489-1/17
  - DoC are available
  - Test reports are available
- For the end product, all the conducted test cases of EN300328 can be inherited from the modules test report.
- Any radiated test cases or ESD under EN300328 and EN301489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



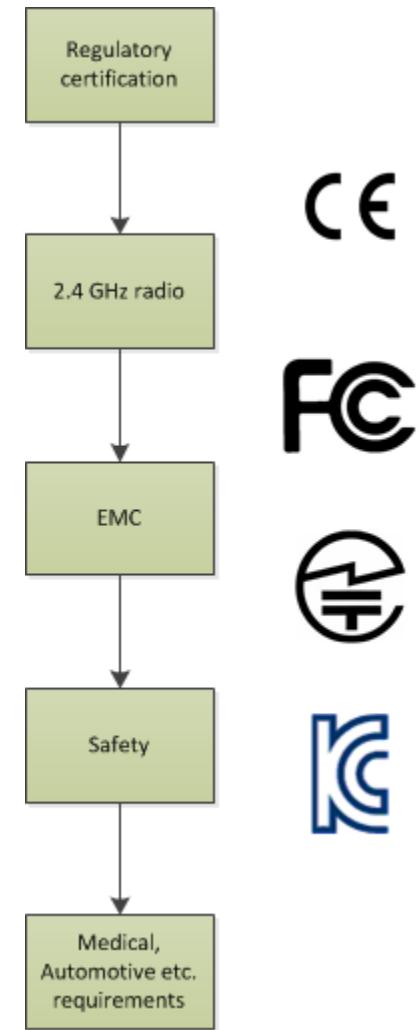
# North America: FCC and IC

- **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



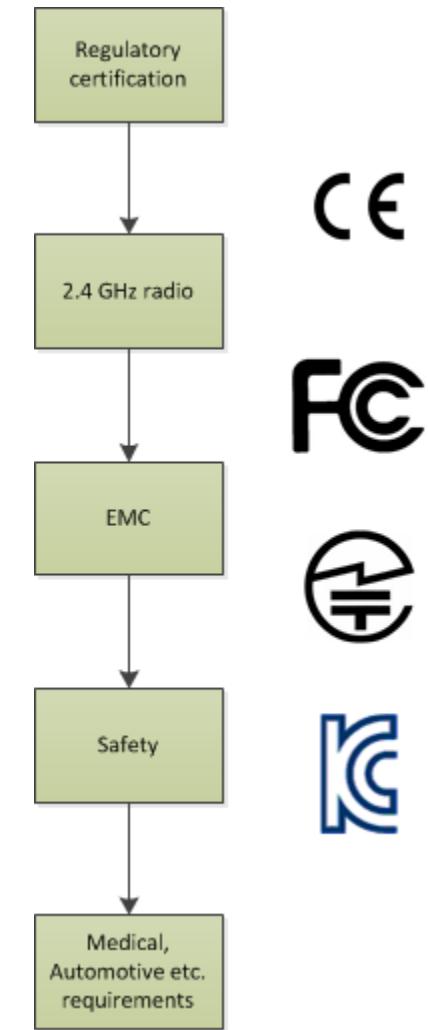
# North America: FCC and IC

- 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



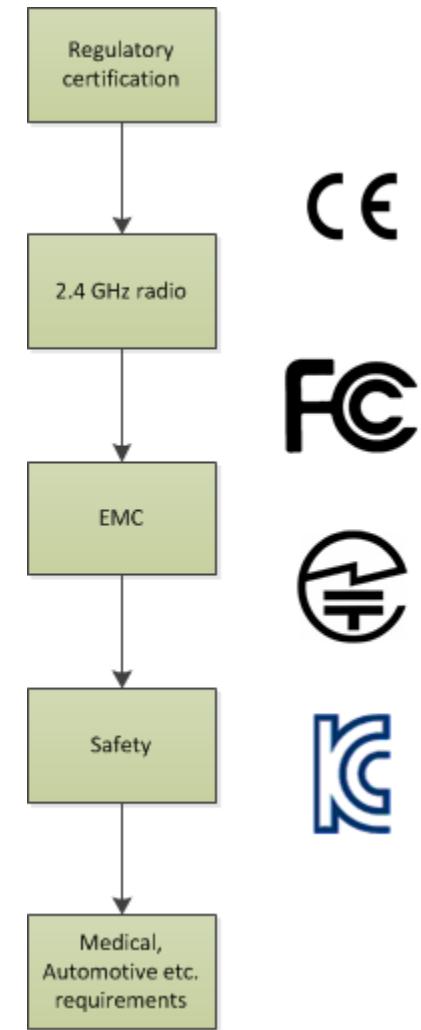
# North-America: FCC and IC

- 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



# Other Markets

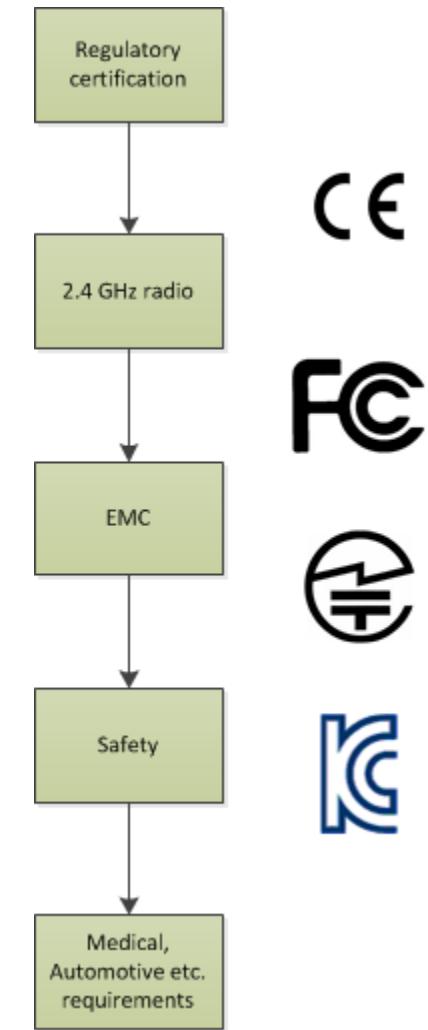
- **Countries following the FCC standards**
  - Anguilla
  - American Samoa
  - Bolivia
  - Cayman Islands
  - El Salvador
  - Federated States of Micronesia
  - Guam
  - Guatemala
  - Marshall Islands
  - Northern Mariana Islands
  - Palau
  - Panama
  - Puerto Rico
  - Virgin Islands (US)

# Other Markets

- **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

# Other Markets

- **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**

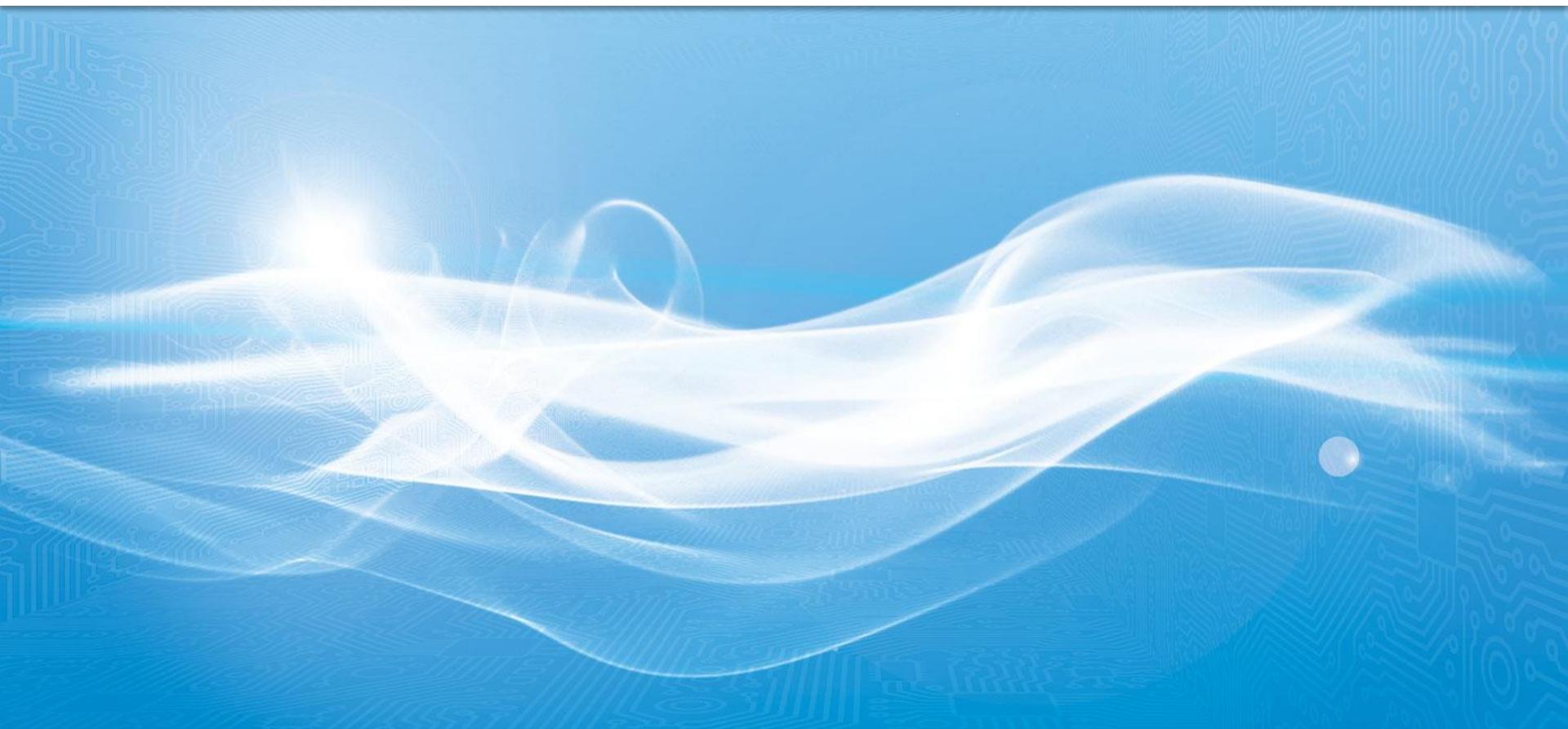


# Steps for Regulatory Compliance

- **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.

# Steps for Regulatory Compliance

- **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	ALSO: 3-6 months of work
Regulatory certification cost	CE	\$7 900	
	FCC	\$7 900	
	IC	\$7 900	
	Japan	\$8 600	
	Korea	\$4 500	
Bluetooth qualification cost	Australia	\$4 500	
	Bluetooth RF	\$18 520	
	Bluetooth SW	\$17 500	
Equipment cost	End product listing	\$10 000	
	Testing equipment	\$57 500	
Total costs		\$144 820,00	
Annual volume		50000 pcs	
Cost per unit		\$2,90	
	Total		\$57 500

## Equipment cost

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

# Costs : Wi-Fi

Category	Item	Cost	
Regulatory certification cost	CE	\$7 900	<b>ALSO:</b> 3-6 months of work
	FCC	\$7 900	
	IC	\$7 900	
	Japan	\$8 600	
	Korea	\$4 500	
Wi-Fi qualification cost	Australia	\$4 500	
	Alliance membership / annual	\$15 000	
Equipment cost	Testing	\$10 000	
	Testing equipment	\$40 000	
Annual volume		50 000 pcs	
Cost per unit		\$2,04	
			Equipment cost
	IOP equipment		\$5 000
	Wi-Fi analyzer		\$15 000
	Spectrum analyzer		\$20 000
	Total		\$40 000



# Summary

- **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

