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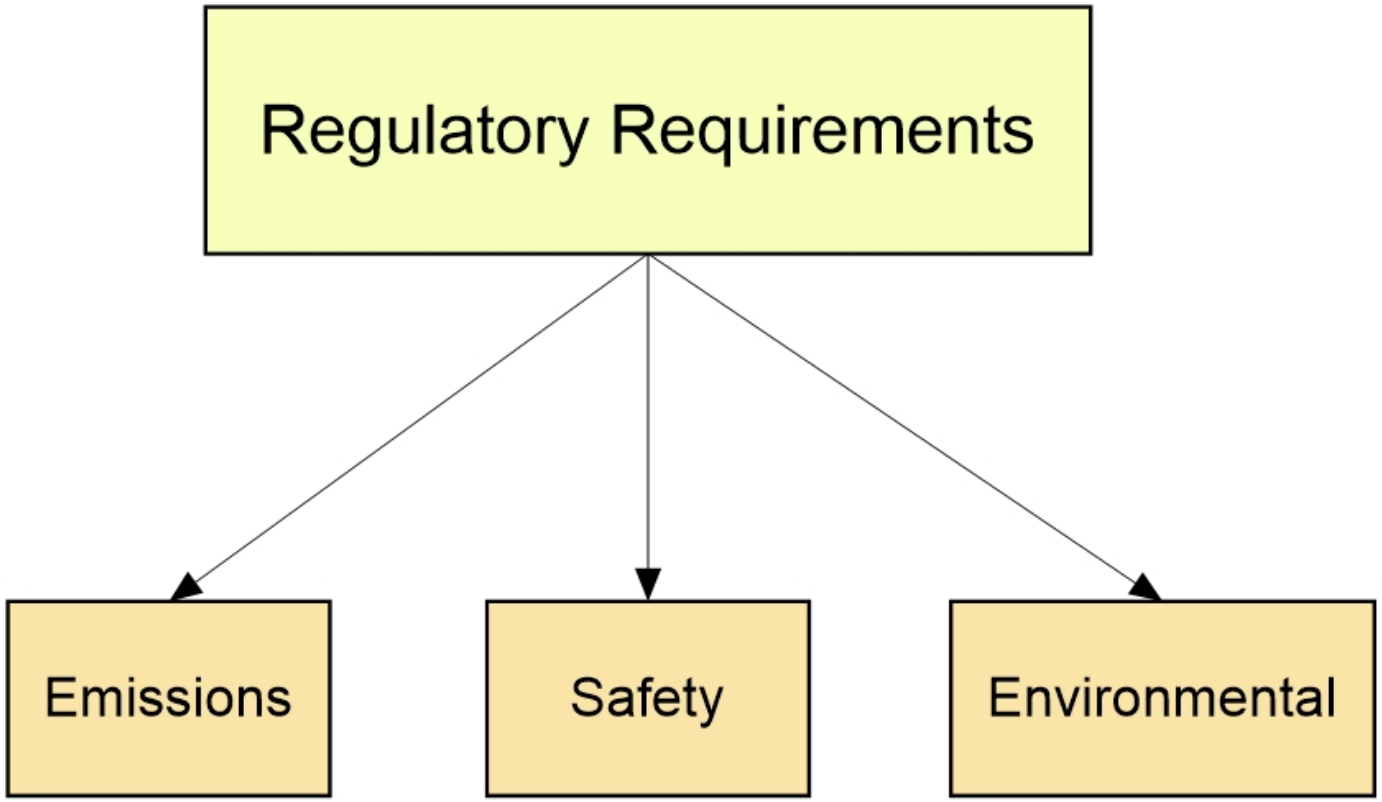
# Understanding Certifications and Regulatory Requirements

PREDICTABLE DESIGNS

# Overview of Electrical Certifications



# Emissions Requirements (FCC)


- Most products that oscillate > 9kHz need FCC radiated emissions authorization
- Licensed vs unlicensed
- Two classes of digital circuits: A=industrial, B=consumer
- Part 15 vs Part 18
- Three types of radiated emissions certification:
  - Incidental radiator – Lightly regulated
  - Non-Intentional radiator
  - Intentional radiator
- Conducted emissions testing if AC powered
- CISPR 22 / EN 55022 for CE in European Union

# Emissions Requirements


**FCC Authorization**

**Option #1 – Supplier's Declaration of Conformity**

- Only for non-intentional radiators
- Still requires testing and compliance
  - Test report and proof of compliance required upon request
- Testing done by any credible testing lab
- If found compliant no FCC approval required
- Responsible party must be located in the United States

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# Emissions Requirements


**FCC Authorization - Option #2 – Full Certification**

- Most rigorous and most expensive
- Required for intentional radiators
- Required for all transmit-only products
- Only option requiring actual FCC approval
- Costs $10,000+

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# Emissions Requirements


**FCC certification procedure:**

1) Register with FCC
    - FCC Registration Number (FRN)
    - Grantee code (designates the manufacturer)
2) Select a testing lab
3) Submit final production prototype for testing
4) FCC authorized TCB will review test data
5) If approved, TCB sends you a Grant of Equipment Authorization

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# Safety Requirements

- North America = Underwriters Laboratories (UL)
- UL is not a federal agency, but a defacto safety requirement
- No governmental requirement for UL certification. Retails and liability insurance requires UL.
- UL is not one standard. Manufacturer must determine which UL standards apply for their specific product
  - UL60950 (IT equipment), UL60601 (medical devices), etc.

# Safety Requirements

- Many UL standards require other standards for sub-parts
- Many UL standards have been harmonized to international standards like IEC
- UL62133 = IEC62133 for rechargeable lithium-ion batteries
  - UL1642 for individual cells, UL2054 for battery packs (replaced by 62133)
- Necessary for products powered from AC due to safety and fire hazards
- UL Recognized (sub-assemblies) vs UL Listed (final products)
- Canada recognizes UL certification but also offers equivalent CSA
- European Union and other regions very similar requirements (CE)

# Safety Requirements

- Lithium batteries
  - UN38.3 for shipping – Self-certify, testing optional
  - UL1642/IEC62133 - Safety
- Toys
- Food products
- Medical devices
- Wearables
  - If RF then Specific Absorption Rate (SAR)
  - Glasses must meet special FDA requirements

# Environmental Regulations

- EnergyStar (USA)
- California Energy Commission
  - Battery charger efficiency requirements
- Patchwork of state regulations for banned substances (USA)
- Disposal of electronic waste is also a patchwork of legislations in USA

# Environmental Regulations

- RoHS 2 compliance required in Europe
  - Verifies no dangerous substances like lead, mercury, etc.
  - Contract manufacturer may handle RoHS for you.
  - Be sure to only use lead-free components and PCB
  - Applies to entire product not just electronics
- Limited version of RoHS required in California
- Waste of Electrical and Electronic Equipment (WEEE) required in Europe

# Tips to Lower Certifications Cost/Complexity

- Use pre-certified radio modules ideally with built-in antenna
  - If no built-in antenna must use same antenna used for pre-certification
- Use modules for high-speed microprocessors and switching regulators
- Most regulations not required for sales test
  - Except intentional radiators and AC powered products
- Start by certifying and selling in one region before expanding
- Perform internal regulatory testing during development
- Don’t submit for regulatory testing until product is finalized for production

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# Product Certification Examples

**Product A – Bluetooth + Microcontroller + Rechargeable Li-ion battery**

**Primary market = United States**

**Emissions** - If pre-certified Bluetooth module used then only FCC Verification authorization is required since it will be classified as non-intentional radiator.

**Safety** – If external pre-certified AC/DC wall charger used then no overall safety certification required.

- If no pre-certified adapter then full product UL certification required
- IEC62133 and UN38.3 required for li-ion battery

**Environment** – RoHS and California Energy Commission if sold in California

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# Product Certification Examples

## **Example #1 –** Bluetooth + Rechargeable Li-ion battery

**Market:** United States

| | Option #1 | Option #2 | Option #3 |
|---|---|---|---|
| Emissions | FCC (certification) | FCC (verification) | FCC (verification) |
| Safety | UL, IEC62133, UN38.3 | UL, IEC62133, UN38.3 | IEC62133, UN38.3 |
| Environmental | RoHS, CEC | RoHS, CEC | RoHS |

**Option #1** = Custom Bluetooth radio + Custom AC/DC charge adapter
**Option #2** – Pre-certified Bluetooth module + Custom AC/DC charge adapter
**Option #3** – Pre-certified Bluetooth module + Pre-certified external AC/DC adapter

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# Product Certification Examples

## **Example #2 –** Bluetooth + WiFi + Alkaline battery

### **Market:** United States

| | Option #1 | Option #2 | Option #3 |
|---|---|---|---|
| Emissions | FCC (certification) | FCC (verification)* | FCC (verification) |
| Safety | None | None | None |
| Environmental | RoHS | RoHS | RoHS |

* May require Class II Permissive Change filing if pre-certified modules don't have co-location note in grant and will transmit simultaneously. If module grants include co-location authorization then only Class I Change (no filing) required.

**Option #1** = Custom Bluetooth radio + Custom WiFi radio
**Option #2** – Pre-certified Bluetooth module + Pre-certified WiFi radio
**Option #3** – Pre-certified single WiFi/Bluetooth module

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# Product Certification Examples

## **Example #3 –** WiFi + LTE-M + Rechargeable Li-ion battery

### **Market:** United States

| | Option #1 | Option #2 |
|---|---|---|
| Emissions | FCC (certification) | FCC (verification)* |
| Safety | UL, IEC62133, UN38.3 | IEC62133, UN38.3 |
| Environmental | RoHS, CEC | RoHS |

* May require Class II Permissive Change filing if pre-certified modules don't have co-location note in grant and will transmit simultaneously. If module grants include co-location authorization then only Class I Change (no filing) required.

**Option #1** = Custom radios + Custom AC/DC adapter
**Option #2** – Pre-certified modules + Pre-certified AC/DC adapter

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# Product Certification Examples

**Example #4 –** Bluetooth + Rechargeable Li-ion battery

**Market:** European Union

| | Option #1 |
|---|---|
| Emissions | CE |
| Safety | CE, IEC62133, UN38.3 |
| Environmental | RoHS, WEEE |

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