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Getting on the Air Quickly in the U.S. with Unlicensed Operation

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Overview

- FCC “unlicensed” regime:
  - transmitter must have FCC certification for compliance with technical rules
    - rules limit interference to other spectrum users
- Device can be legally operated by anyone, almost anywhere in the U.S.
- Regulated under Part 15 of FCC rules
- Examples:
  - Wi-Fi, Bluetooth, ZigBee, cordless phones, RFID (security tags, EZPass, transit fare cards, etc.), remote vehicle access, smart meters, remote control toys, garage door openers, medical telemetry, control of implanted devices, countless more.

Pros and Cons of Part 15 Operation

- Pros:
  - can get on air quickly if device complies with FCC technical rules
    - typically takes about two weeks; can be expedited
  - no paperwork for end user: open the box and turn it on
- Cons:
  - must comply with FCC technical rules
    - largely geared to established technologies.

Part 15 vs. Experimental Licensing

	Part 15	Experimental
Compliance w/ FCC technical rules	Required	Not req'd
Can sell devices	Yes	No (usually)
Can sell service	Yes	No (usually)
Area of operation	anywhere in U.S.	per license
Expires	never	2 years
Lead time	2 weeks	4-8 weeks
Cost	$6-10k	$65

Part 15 Frequencies – Three Categories

- Choice of frequency band is an early, critical decision in designing a Part 15 device
  - typically guided by both technical and regulatory considerations
- Three kinds of frequencies:
  1. Restricted bands
  2. Special purpose bands
  3. All other bands.

Part 15 Frequencies (1) – Restricted Bands

- No intentional Part 15 emissions
  - listed at 47 C.F.R. § 15.205
  - *e.g.*, GPS, other satellite downlink, search & rescue
  - also include most frequencies above 38.6 GHz
  - exception: ultra-wideband and wideband devices allowed
    - limited to very low power spectral density
    - typical max is –41.3 dBm (75 nW) per MHz.

Part 15 Frequencies (2) – Special Purpose

- Relatively high power allowed
  - listed in 47 C.F.R. §15 subpart C
  - separate, detailed rules for each band
  - many bands limited to specific applications
  - some indoor-only; some barred from aircraft and satellites
  - some power limits depend on the application
- Examples: bands used for Wi-Fi, Bluetooth, U-NII, DECT cordless phones, wireless microphones, vehicle radars, industrial radars, airport radars, more.

Part 15 Frequencies (3) – Other

- All other frequencies:
  - default power limits apply
  - no restrictions on application
- Power limits:

1.705-30 MHz	27.0 nW	–45.7 dBm
30-88 MHz*	3.0 nW	–55.2 dBm
88-216 MHz*	6.75 nW	–51.7 dBm
216-960 MHz *	12 .0 nW	–49.2 dBm
above 960 MHz	75.0 nW	–41.3 dBm

* outside the TV bands

- Limits often too low to be useful
  - most Part 15 devices use special purpose bands.

Part 15 Technical Rules

- Most regulate:
  - power (and/or power spectral density)
  - bandwidth (usually specify the maximum, except ultra-wideband and wideband rules which specify minimum)
  - out-of-band emissions
- My also regulate:
  - modulation
  - antenna gain
  - dynamic frequency selection (“listen before talk”)
  - other details (*e.g.*, Bluetooth frequency-hopping patterns)
- More recently adopted rules tend to be more restrictive
  - rules become less restrictive over time.

Getting Part 15 Approval

1. Have accredited lab test device for compliance
2. Lab prepares application for certification
   - includes compliance test report, photos, block diagram, schematics, other data
3. Lab sends application to Telecommunications Certification Body (TCB)
4. TCB grants FCC certification, uploads application to FCC
5. Can distribute device immediately; FCC has 30 days to rescind certification (very rare).

Public Information

- Application becomes public when certification is granted
- Can request *permanent* confidentiality for–
  - schematics, block diagrams, operational descriptions, parts list, tune-up info
  - internal photos (if interior not accessible to user)
  - external photos (if device not accessible to public, *e.g.* on tower and technicians under NDA)
- Can request *short-term* confidentiality (up to 180 days) for–
  - above plus: all product photos, test setup photos, users' manuals
  - short-term confidentiality expires when product is marketed.

Operation Prior to Certification

- Under experimental license
  - even if device is known to be noncompliant
- If device is designed to comply but not yet tested:
  - at trade show
  - for customer evaluation
- Not in residential areas
- Operation in licensed band (such as cell phone band) needs OK from local licensee.

After Part 15 Approval

- Labeling requirements apply
  - "FCC ID" label keys to application in FCC database
  - other labels required
- Certification never expires
  - modification of device may require FCC procedures
- TCB may call in sample units for retesting
- FCC can assess fines for marketing a device that does not conform to its certification
- When technical rules change, FCC announces dates by which:
  1. new certifications must comply with new rules
  2. devices certified under old rules can no longer be sold
     - FCC does not recall old devices in the field.

If Proposed Device Does Not Comply

- Can request waiver from FCC
  - allows certification despite noncompliance
- Generally must make three showings:
  1. device is in the public interest
  2. device will not cause harmful interference to other users
  3. cannot achieve objectives in compliance with the rules
- Waiver generally takes 6–24 months
  - FCC usually invites public comment
  - time required depends in part on opposition
- Alternatively can request rule change to accommodate device
  - but takes longer (2–5 years).

Conclusion

- Part 15 is a fast way to get a new device out to many users
- Main drawbacks:
  - must comply with existing technical rules
  - frequency needed may not allow enough power
- Can request waiver, but takes time and costs money
  - usually better to build a compliant device, if possible
  - faster and cheaper to pay engineers than to pay lawyers.

Thank you!

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