A Review of Receiver Regulation

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28 June 2000

FCC TAC

Coase's Analysis

- Coase, Ronald (1960).
  - "The Problem of Social Cost." *Journal of Law and Economics*, Vol. 3.
  - Coase theorem
    - Propertry rights and easy negotiations (zero transactions costs), result in efficient outcomes.
- Problems are joint with transmitters and receivers.
  - No receivers, no problems
  - No transmitters, no problems

Regulation

- Despite the fact that interference requires both transmitters and receivers, the FCC regulates transmitters extensively and receivers hardly at all.
- Similarly, EPA regulates smokestacks but not lungs.

FCC Regulatory Practice

- Historically, most regulation to control interference has focused on transmitters.
- Transmitter regulation is significant in most radio services.
  - e.g., limits on total power, specified modulation, specified frequency, and limits on out-of-band energy
- In contrast, FCC regulation of receivers has been quite limited.

NTIA's Practice

B. Receiver Standards

1. Selectivity. The passband[2] shall be no greater than the authorized bandwidth of emission and the slope of the selectivity characteristic outside the passband shall be 100 dB/kHz.

2. Tunability. The equipment shall be capable of operation on any frequency within its tuning range. However, where a synthesizer is employed as the frequency controlling element, the receiver shall be capable of operation on any frequency which is an integral multiple of 0.1 kHz.

Federal Government Radio Systems and Civil Receivers

- Government systems can interfere with co- or adjacent-channel civil systems.
- Even if such civil systems are theoretically secondary or suffer interference due to poor receiver selectivity, the outcome is often that the government system must adjust (voters trump bureaucrats).

Korean Statute

- Standards for Prevention of Electromagnetic Interference, etc.
  - The standards for preventing any electromagnetic interference by apparatus that causes the electromagnetic interference (hereinafter referred to as "apparatus causing electromagnetic interference") and those for protection from electromagnetic waves of apparatus influenced by electromagnetic waves shall be prescribed by the Ordinance of the Ministry of Information and Communication.

European Radiocommunications Committee (ERC)

- Recommendation (00)06
  - Receiver Parameters
- Where justified, administrations should seek to get receiver parameter limits included as essential parameters in harmonised standards or in national regulated interface specifications on a case by case basis and in accordance with the list in Annex A;

Industry Canada

- With the exception of **receiver** spurious emissions, **receiver** standards are no longer part of the RSS (Receiver Standards Specification)
    - Notice No. SMSE-001-99 regarding Radio Standards Specification 182 (RSS-182), Issue 3, Maritime Radio Transmitters and Receivers in the Band 156-162.5 MHz.

Receiver Issues

- Conectivity/interoperability
- Privacy
- Performance
- Interference susceptibility and efficient spectrum use

FCC Receiver Regulation: Connectivity/Interoperability

- Competition: Sections 314 and 322 of the ‘34 ACT
- Interconnection: Maritime watch requirements (section 355)
- Section 624A (CE Compatability)
- Cable Television (CATV)

FCC Receiver Regulation: Privacy

- Section 705, Prohibitions on receiving messages meant for others
- Section 302(d), Prohibition of cellular scanners

FCC Receiver Regulation: Performance

- All-channel receiver act
  - Sections 303(s) and 330
  - CUB petition on UHF Noise Figure/Attached Antennas
    - FCC adopted specific rules
- Closed captioning
- V-Chip

FCC Reciver Regulation: Interference Susceptibility

- Interference
  - 302(b)(2) establishing minimum performance standards for home electronic equipment and systems to reduce their susceptibility to interference from radio frequency energy.

FCC Inquiry on CB Interference to TV

- General Docket No. 78-369
- Staff report
  - Mandatory standards
  - Voluntary standards
  - Combined transmitter/receiver liability
  - Other transmitter liability
  - Labeling

Hearing Aid Example

- Many hearing aids act as inadvertent receivers of TDMA cellular and PCS transmissions.
- Is the problem due to the radio transmitter or the design of the hearing aid?

FCC Receiver Regulation: Efficient Spectrum Use

- Repacking
  - Better receivers allow squeezing in more service
- Incentive problem
  - What are the incentives for adopting more spectrum-efficient receivers?

Repacking

- Television
  - UHF Taboo example
  - Digital TV transition
- Audio broadcasting
- Closer spacing of C-band satellites
  - Move from 4 degree to 2 degree spacing
- Refarming in traditional land mobile
- Cellular/PCS

Improved UHF TV Receiver (March 1978)

- Double conversion, SAW filter at IF
- Improved receivers would double the number of possible stations on the UHF TV band
- New receivers had to be in place before the new stations could operate
- Incentives for consumers and manufacturers?

The Incentive Problem

- More selective receivers increase costs but provide no new services in the short run—why should consumers buy them?
- If consumers have no incentive to buy, why should manufacturers build?
- This incentive problem appears to be most severe in broadcast services.

Digital Television

- Washington, D.C., May 17, 2000 – The National Association of Broadcasters today urged the Federal Communications Commission to adopt "strong, specific and decisive" pro-consumer actions to ensure a successful transition to digital television, *including a requirement that all TV sets have the capability of receiving DTV signals*.

Traditional Land Mobile

- Out-of-band constraints on transmitters are strict.
- System performance depends upon both the interference environment and receiver selectivity.
- Better receiver selectivity improves system performance.
- Receiver regulation might facilitate refarming.

Possible Solutions

- Do nothing
- Regulation
- Labeling
- Property rights
  - Microwave coordination
  - Cellular/PCS/satellites
  - Property rights approach would not work well with (free) broadcasting.

Conclusions

- The FCC often regulates receivers but rarely in order to improve spectrum efficiency.
- Weak incentives for the adoption of spectrum-efficient receivers lead to inefficient spectrum use in some services.