

Receivers, Interference and Regulatory Options: A Silicon Flatirons Roundtable

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Co-sponsored by CTIA and Public Knowledge

Meeting Brief

The 100th anniversary of the sinking of Titanic reminds us that we are celebrating a century of spectrum management since the Radio Act of 1912. While many regulatory questions have been resolved over this period, the fundamental question of how to maximize value and minimize interference remains unchanged, and calls to improve the use of spectrum continue unabated.

Today, as much as ever, we need to maximize the value of radios to users by enabling closer band packing, increased access, and device innovation. More diverse services packed ever closer to each other have made it more important than ever to make wise trade-offs between the interests of transmitters and receivers across service boundaries. The inconclusive debate over receiver regulation over the last decade shows that both operators and regulators need a framework for resolving inter-service interference that includes transmitter as well as receiver considerations. To that end, this meeting will focus on the technical aspects of receiver-oriented regulation, particularly regarding rights definition and enforcement. Economic aspects (e.g., rights assignment) are just as important, but will not be addressed in this conversation.

Meeting goals

- Broaden the circle of spectrum players thinking about interference limits policy as part of receiver regulation
- Test, evolve and improve interference limits as a policy solution
- Test ideas from, and provide input to, the FCC TAC receivers working group
- Recommend actions to the FCC

Background

Receiver regulation goes back to the beginning: the 1912 Radio Act included a requirement, inspired by the Titanic tragedy, that shipboard radios should be able to receive a distress signal from one hundred nautical miles away.¹ However, the 1927 Act established the custom that the Commission should only regulate transmissions.² Still, it has long been understood that receiver performance was a key factor in managing interference. For example, in the early 1980s the FCC commissioned an engineering firm to design and build a TV receiver “to demonstrate the feasibility of a cost-effective, high performance system that would permit greater utilization of spectrum currently allocated to UHF television broadcasting.”³

Just 10 years ago, the FCC Spectrum Policy Task Force (SPTF) presented a report recommending that the Commission should adopt, where feasible, “a more quantitative approach to interference management” based on “characterizing the ‘worst case’ environment in which a receiver would be expected to operate.”⁴ The report also recommended that the Commission “should consider applying receiver performance requirements for some bands and services.”⁵ In 2003, the FCC responded with a Notice of Inquiry regarding receiver performance.⁶ The Notice recognized that “incorporation of receiver performance specifications could serve to promote more efficient utilization of the spectrum”⁷ but was met with opposition from many parties who questioned the FCC’s authority to impose receiver standards

¹ Radio Act of 1912, 37 Stat. 302 *available at* <http://earlyradiohistory.us/1912act.htm> (“Every station on shipboard . . . shall be prepared to send distress signals . . . with sufficient power to enable them to be received by day over sea a distance of one hundred nautical miles by a shipboard station equipped with apparatus for both sending and receiving equal in all essential particulars to that of the station first mentioned”).

² Act of Feb. 23, 1927, Pub. L. No. 632, § 4(e) (“Except as otherwise provided in this Act, the commission, from time to time, as public convenience, interest, or necessity requires, shall . . . (e) Regulate the kind of apparatus to be used with respect to its external effects and the purity and sharpness of the emissions from each station and from the apparatus therein”).

³ Ash, D. L. (1984), Improved high performance television receiver. Technical report by RF Monolithics, FCC.

⁴ F.C.C., SPECTRUM POLICY TASK FORCE, REPORT OF THE SPECTRUM EFFICIENCY WORKING GROUP 4 (Nov. 15, 2002), *available at* http://transition.fcc.gov/sptf/files/SEWGFfinalReport_1.pdf.

⁵ *Id.* at 5.

⁶ Interference Immunity Specifications for Radio Receivers, *Notice of Inquiry*, ET Docket No. 03-65 and MM Docket No. 0-39, 18 FCC Rcd 6039, (2003).

⁷ *Id.* at ¶ 1.

and claimed that the setting of receiver standards should be left to industry.⁸ The Notice was terminated in 2007.⁹

Receiver issues also received attention during the Obama administration, largely due to the LightSquared/GPS issue. In its February 14th, 2012 letter to the FCC, the NTIA noted that there are currently no federal, FCC, or industry developed GPS receiver standards (except for international standards for certified aviation devices), and that federal agencies would move forward in 2012 to develop and establish new GPS spectrum interference standards.¹⁰ The FCC organized a workshop on receiver management in March 2012,¹¹ and asked an FCC TAC working group to examine the role of receivers in ensuring efficient use of the spectrum and avoiding obstacles to making spectrum available for new services.¹² In July 2012 PCAST recommended that NTIA and the FCC should “establish methodologies for spectrum management that consider both transmitter and receiver characteristics.”¹³

Receiver performance has a key bearing on several current rulemakings, including GPS/LightSquared, the UHF incentive auction, and federal/non-federal sharing in the 1755-1850 and 3550-3650 MHz bands.

Over the past several years, Silicon Flatirons has facilitated discussion about the difficulties of managing radio interference. Over time, the attention has focused more specifically on receiver performance. The 2009 roundtable “Defining Inter-Channel Operating Rules” drew attention to the interference problems rooted in inter-service boundary conflicts, specifically acknowledging the variances

⁸ AT&T Wireless Comments to the Interference Immunity Specifications for Radio Receivers, *Notice of Inquiry*, ET Docket No. 03-65 and MM Docket No. 0-39, 18 FCC Rcd 6039, at 14- 18 (2003), CEA Comments to the Interference Immunity Specifications for Radio Receivers, *Notice of Inquiry*, ET Docket No. 03-65 and MM Docket No. 0-39, 18 FCC Rcd 6039 at 11 (2003).

⁹ F.C.C., Interference Immunity Specifications for Radio Receivers, *Proceeding Terminated*, ET Docket No. 03-65, FCC-07-79, (2007).

¹⁰ Letter from Lawrence E. Strickling to Chairman Genachowski (Feb. 14, 2012), in *NTIA LightSquared Recommendations to the FCC*, 6-7 available at http://www.ntia.doc.gov/files/ntia/publications/lightsquared_letter_to_chairman_genachowski_-_feb_14_2012.pdf.

¹¹ F.C.C., *Public Notice*. DA 12-425 (Mar. 20, 2012).

¹² F.C.C., Technical Advisory Council, *Report to the TAC* 115-126 (Sep. 24, 2012) available at <http://transition.fcc.gov/bureaus/oet/tac/tacdocs/meeting92412/TAC-9-24-12-Presentations.pdf>.

¹³ President’s Council of Advisors on Science and Technology, *Realizing the Full Potential of Government-Held Spectrum to Spur Economic Growth* 76 (Washington, DC, July 20, 2012), <http://www.whitehouse.gov/administration/eop/ostp/pcast>.

in the abilities of receivers to reject interference. In 2010, Silicon Flatirons hosted “The Unfinished Radio Revolution: New Approaches to Handling Wireless Interference,” which discussed the importance of clear, predictable, and objective rights. Most recently, the 2011 roundtable “Efficient Interference Management: Regulation, Receivers, and Right Enforcement” acknowledged the potential of receiver interference protection limits in regulating interference. Consensus was reached that an interference limits approach was preferred over specific receiver performance standards, although some advocated for some receiver standards as a short-term solution.¹⁴

While a consensus is clearly emerging that the role of receivers in interference should be recognized in wireless regulation, one may wonder why it has taken so long to come to a conclusion about the performance of receivers. One may speculate about three reasons.¹⁵ First, there may not be a problem to be solved: limiting the regulator’s scope to transmission permissions may be the least costly option for maximizing spectrum use. Second, if there is indeed a problem, it may be intractable given the institutional or technical context. Finally, the problem may be solvable but the necessary techniques, particularly the definition of spectrum usage rights (SURs) using resulting signal strength metrics, have not been available until recently.

Today, Silicon Flatirons and its partners again address the question of including receiver considerations in spectrum management. Our focus this time is on recommendations that are being developed by the 2012 FCC TAC receivers working group, particular the implementation of receiver harm claim thresholds as part of an interference limits policy approach.

¹⁴ Madelaine Maior, *Efficient Interference Management: Regulation, Receivers, and Right Enforcement*, A report on a Silicon Flatirons Summit, held 18 October 2011, at 3 (Jan. 10, 2012), available at <http://siliconflatirons.com/documents/Roundtables/2011.10.18-1021/EfficientInterferenceManagement.pdf>.

¹⁵ Pierre de Vries & Madelaine Maior, *Receiver regulation: Why no progress?*, DEEP FREEZE 9, Thursday, October, 25, 2012, <http://deepfreeze9.blogspot.com/2012/10/receiver-regulation-why-no-progress.html>.

Agenda

Welcome, introductions, ground rules, outline of goals and agenda (30 minutes)

Receiver regulation story to date (30 minutes)

- Summary/timeline of receiver proceedings
- Case study laundry list – short discussion of "lessons (to be) learned"

Outline of interference limits approach (45 minutes)

- The approach – device performance mandates vs. harm claim thresholds; decoupled receivers
- Example – TV receivers and cellular base stations
- Discussion

Implementation – bands, institutions, timelines (45 minutes)

- Possible bands – e.g. UHF, 3550-3650
- Multi-stakeholder (MSH) approach and/or rulemaking
- Alternatives – receiver specifications, do nothing
- Discussion

Enforcement (45 minutes)

- Enforcement decision tree
- Discussion

Recommendations for FCC action (45 minutes)

- Outline TAC group suggestions
- Discussion

Attendees

Lynn Claudy, NAB

Pierre de Vries, Silicon Flatirons Center

Ed Drocella, NTIA

Harold Feld, Public Knowledge

Paul Galyean, consultant

David Gurney, Motorola

Chris Guttman-McCabe, CTIA

Dale Hatfield, University of Colorado

Chuck Jackson, consultant

Bruce Jacobs, Pillsbury Winthrop Shaw Pittman

Julius Knapp, FCC

Evan Kwerel, FCC

Mike Marcus, consultant

Paul Margie, Wiltshire & Grannis

Brian Markwalter, CEA

Preston Marshall, USC ISI

Robert Pavlak, FCC

Charla Rath, Verizon

Dennis Roberson, IIT

Steve Sharkey, T-Mobile

Doug Sicker, University of Colorado (chair)

Peter Tenhula, NTIA

John Williams, FCC

Rapporteurs

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Observing

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