
**Before the
Federal Communications Commission
Washington, DC 20554**

In the Matter of)
)
Interference Immunity Performance) ET Docket No. 03-65
Specifications for Radio Receivers)
)
Review of the Commission's Rules and) MM Docket No. 00-39
Policies Affecting the Conversion to Digital)
Television)
)

To: The Commission

**COMMENTS OF BELLSOUTH CORPORATION
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SUMMARY

BellSouth Corporation and Cingular Wireless LLC (collectively “Joint Commenters”) urge the Commission to terminate the subject inquiry regarding receiver performance standards. Receiver performance standards were proposed by the Commission’s Spectrum Policy Task Force (“SPTF”) as a transitional mechanism for implementation of the “interference temperature approach” to spectrum management. The Commission has not yet determined whether to adopt the interference temperature concept. Moreover, the SPTF, the Technological Advisory Council, and the Commission have all acknowledged that comprehensive, current data regarding the noise floor must be compiled and analyzed before adopting receiver standards and implementing the interference temperature concept. Accordingly, the Commission should terminate the subject inquiry until (i) it determines whether the interference temperature concept has validity and should be adopted, and (ii) it completes comprehensive noise floor studies and analysis.

If the Commission nevertheless moves forward with its inquiry, it should conclude that new receiver performance standards for commercial wireless services are unnecessary. Adoption of new standards will stifle innovation by manufacturers and incumbent providers, will increase costs to consumers, and will promote the inefficient use of spectrum. Voluntary standards already exist and promote innovation and the efficient use of spectrum by incumbent users. The Commission should uphold these standards and take steps to minimize existing congestion in spectrum below 3 GHz. In particular, the Commission should discourage additional unlicensed use below 3 GHz and take steps that will promote the development and deployment of new services and uses in less congested bands.

To the extent the Commission determines that new receiver performance standards are necessary, it must weigh the benefits associated with each new requirement against the costs the requirement would impose on existing carriers and users. In most cases, every improvement in receiver performance adversely affects the price of receivers and the performance of existing systems. Finally, an adequate transition period should be established to afford consumers with legacy handsets continued interference protection.

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COMMENTS

BellSouth Corporation (“BellSouth”) and Cingular Wireless LLC (“Cingular”) (collectively “Joint Commenters”),¹ on behalf of their affiliates and subsidiaries, hereby submit these comments in response to the Commission’s *Notice of Inquiry* in the captioned proceeding.² Specifically, the Commission is putting the proverbial cart before the horse by moving forward with the *NOI* before issuing an Order in the Spectrum Policy Task Force proceeding.³ Adoption

¹ The Joint Commenters hold numerous interests in radio spectrum and would be adversely affected by any decision that impairs their ability to operate their radio systems. BellSouth subsidiaries operate (or are authorized to operate) radio systems in bands designated for the following services: Multipoint Distribution Service (“MDS”); Multichannel, Multipoint Distribution Service (“MMDS”); Instructional Television Fixed Services (“ITFS”); and the Wireless Communication Service (“WCS”). Cingular is a joint venture created by the combination of commercial mobile radio service (“CMRS”) licenses held by SBC Communications Inc. (“SBC”) and BellSouth. Cingular is the second largest, nationwide CMRS provider.

² *Interference Immunity Performance Specifications for Radio Receivers, Review of the Commission’s Rules and Policies Affecting the Conversion to Digital Television*, ET Docket No. 03-65, MM Docket No. 00-39, *Notice of Inquiry*, FCC 03-54 (Mar. 24, 2003), summarized 68 Fed. Reg. 23677 (May 5, 2003) (“*NOI*”).

³ *Commission Seeks Public Comment on Spectrum Policy Task Force Report, Public Notice*, ET Docket 02-135, FCC 02-322 (rel. Nov. 25, 2002) (“*Notice*”).

of new receiver standards for existing commercial wireless services will stifle innovation, will increase costs to consumers, and will prevent the most efficient use of spectrum.⁴ Receiver performance standards already exist for many wireless industries and technologies. In order for these and other voluntary standards to have their intended effect, they cannot be disregarded by the FCC. If the Commission determines that the existing standards are insufficient and additional receiver standards are needed, it must balance the purported benefits associated with improvements in performance against the financial and technical costs such improvements would impose on incumbent service providers and their subscribers. Finally, if new standards are adopted, an adequate transition period should be adopted to protect legacy handsets and minimize customer confusion.

BACKGROUND

One of the central reasons Congress created the Commission was to end the chaos of interference that resulted from a free-for-all of spectrum usage.⁵ The foundational step in establishing order is contained in Section 301 of the Communications Act of 1934, as amended (“the Act”), which states:

No person shall use or operate *any apparatus* for the transmission of energy or communications or signals by radio . . . except in

⁴ These comments focus on receiver performance standards for *commercial* wireless services. Receiver performance standards may be beneficial where market incentives do not exist to deploy receivers with significant rejection capabilities (*e.g.*, public safety), or where the licensee does not control distribution of the end-user product (*e.g.*, television receivers).

⁵ See *Red Lion Broad. v. FCC*, 395 U.S. 367, 375-77 (1969); FCC Office of Network Study, Second Interim Report on Television Network Procurement, 65-66 (1965); *National Broadcasting Co. v. U.S.*, 319 U.S. 190, 212 (1943) (“*NBC*”) (“With everybody on the air, nobody could be heard.”).

accordance with this Act *and with a license* in that behalf granted under the provisions of the Act.⁶

By enacting Section 301, Congress prohibited wireless transmissions without a license.⁷ Thus, through various licensing processes, the Commission could establish entry criteria and reduce the potential for interference.

On December 11, 1998, the Commission created the Technological Advisory Council (“TAC”) to provide technical advice and to make recommendations on the issues and questions presented to it by the FCC.⁸ On May 26, 1999, the Commission requested that the TAC study the noise floor and propose new approaches to spectrum management based on emerging and future technologies.⁹ In making this request, the Commission noted that electromagnetic noise levels had not been studied for *more than twenty years*.¹⁰ The request also noted that the “commercially viable range of radio frequency devices has significantly expanded” and that, although these devices were previously limited to the 30 MHz to 3 GHz range, “communications

⁶ 47 U.S.C. § 301 (emphasis added).

⁷ Section 307(e) sets forth the only exceptions to this requirement. 47 U.S.C. § 307(e) (exempting the citizens band radio service, radio control service, aviation radio service, and maritime radio service from the license requirement). Despite the prohibition on unlicensed operations, the Commission now permits unlicensed operations that do not fall within the Section 307(e) exceptions and the subject *NOI* proposes receiver standards as a mechanism that would potentially permit additional unlicensed operations. Cingular and others have previously challenged the Commission’s authority to permit such unlicensed operations. *See, e.g.*, Cingular Comments, ET Docket No. 02-135, at 18-20 (Jan. 27, 2003) (“Cingular Report Comments”); Cingular Petition for Reconsideration, ET Docket No. 98-153, at 10-12 (May 22, 2003); American Radio Relay League Petition for Reconsideration, ET Docket No. 98-156 (Feb. 13, 2002). These arguments are incorporated by reference.

⁸ *See* TAC Charter (December 11, 1998).

⁹ Official Requests from the Federal Communications Commission to the Technological Advisory Council, Memorandum of Requests No. 1 (May 26, 1999) (“TAC Mandate”).

devices now utilize spectrum up to and including the oxygen absorption bands to 70 GHz.”¹¹

FCC staff summarized the importance of the TAC as follows:

The regulatory limitations the Commission places on intentional and unintentional emissions are premised on long-standing assumptions about the relevant ambient environmental noise. Given the dated nature of the Commission’s knowledge underlying those assumptions, as new and innovative radio communications devices emerge it is becoming increasingly important that the Commission base its decisions on a reliable assessment of the noise floor within the United States and its territories. In examining technical limitations, the Commission must determine whether certain restrictive limitations should be relaxed because the incremental noise contribution is insufficient to justify the economic and innovation burdens associated with the restrictions or whether certain limitations should be continued or even increased because the incremental noise increase could impair the efficacy of existing systems.

As we head into the next millennium and the Commission grapples with new and innovative communications technologies, it is essential that the Commission better understand the state of the current noise floor, and the impact of radio emissions on the efficacy of telecommunications systems.¹²

In response to the Commission’s directive, the TAC concluded that it would be impossible for the FCC to engage in effective spectrum management until it “develop[s] a more complete understanding of the current state of the radio noise environment.”¹³ Thus, the TAC urged the FCC to immediately undertake a multi-part study of the noise floor that would include a detailed analysis of available noise floor literature, the creation of detailed noise floor models,

¹⁰ *Id.* at 2.

¹¹ *Id.* at 2 & n.4.

¹² *Id.* at 3.

¹³ FCC Technological Advisory Council, Second Meeting Report at 1, 9 (Oct. 28, 1999).

performance of simulations, and verification of the simulations.¹⁴ The TAC cautioned against implementing new spectrum management techniques or services without first concluding extensive studies of the noise floor:

- There “could be a very serious emerging problem caused by the explosive growth of both intentional and unintentional radio sources. The future could be very different from what we might expect from past experience. The key to getting our hands around this issue will be a good set of models for both intentional and unintentional radiators which can then be used to predict the evolution of the noise background.”¹⁵
- “[W]e could potentially be entering a period of rapid degradation of the noise environment. Such degradation would reduce our ability to meet the communications needs of the country. The principal negative impacts are likely to be reductions in the performance or reliability of wireless systems or increases in their costs.”¹⁶
- “Until [noise floor] information is organized and analyzed, the FCC will not have a firm basis for deciding whether current noise standards are too tight, too loose, or maybe even just right.”¹⁷
- “As we enter the new millennium, new noise sources are being developed (*e.g.*, ultrawideband devices), and other electronic devices continue to proliferate as fast as the technology and the regulatory process will allow. Many of these other individual sources of “noise” may meet the current Federal Communications Commission (FCC) rules, but in great numbers they may negatively impact the overall electromagnetic noise environment.”¹⁸

¹⁴ FCC Technological Advisory Council II, Second Meeting Report, at 8-9 (Nov. 23, 2001).

¹⁵ FCC Technological Advisory Council, Third Meeting Report, at 1 (Jan. 3, 2000).

¹⁶ FCC Technological Advisory Council, Fourth Meeting Report, at 23 (Annex 4) (Mar. 24, 2000).

¹⁷ FCC Technological Advisory Council, Sixth Meeting Report, at 9 (Sept. 27, 2000) (discussing Abstract presented by George H. Hagn).

¹⁸ *Id.* at 25 (Annex 4: Abstract of Hagn Talk).

- “Unlicensed radio seems to be an enormous success, but with the proliferation of more and more systems, we are in effect participating in an unplanned experiment in real time and are not sure how to predict the final outcome.”¹⁹

Subsequently, the Spectrum Policy Task Force (“SPTF”)²⁰ was formed “to assist the Commission in identifying and evaluating changes in spectrum policy that will increase the public benefits derived from the use of radio spectrum.”²¹ On November 7, 2002, the SPTF issued a Report recommending sweeping changes in the Commission’s approach to spectrum management.²²

In particular, the SPTF Report suggested that the Commission adopt a new and untested approach to spectrum management that incorporated an interference temperature concept.²³ In essence, this approach, in theory, would divide each spectrum block horizontally into a licensed portion above a specified signal level and an unlicensed portion below that level.

Recognizing the dangers associated with adoption of a novel and untested concept, the SPTF identified two precursors to the implementation of the interference temperature concept:

- the compilation of current, comprehensive data regarding the noise floor (including a standard method for measuring the noise floor) and existing spectrum usage;²⁴ and

¹⁹ FCC Technological Advisory Council II, First Meeting Report, at 10 (Aug. 26, 2001).

²⁰ Membership on the SPTF and its working groups was limited to FCC staff.

²¹ FCC News Release, FCC Chairman Michael K. Powell Announces Formation of Spectrum Policy Task Force (June 6, 2002).

²² Spectrum Policy Task Force Report, ET Docket No. 02-135 (Nov. 1, 2002) (“SPTF Report”).

²³ SPTF Report at 27-30. *But see, supra*, note 7.

²⁴ SPTF Report at 5, 28, 33; *accord* SPTF Report at 64 (calling the interference temperature a “long-term objective”). The SPTF’s Interference Protection Working Group (“Interference Working Group”). The Interference Working Group maintained that an extensive study was a precursor to the implementation of the interference temperature concept. The
(continued on next page)

- an evaluation of current and future receiver environments.²⁵

The SPTF also indicated that, at least initially, the Commission should limit the interference temperature concept to new spectrum allocations.²⁶

On November 25, 2002, the Commission sought comment on the findings and recommendations contained in the SPTF Report.²⁷ To date, the Commission has not adopted the report or responded to the comments submitted regarding the report. Nevertheless, on March 24, 2003, the Commission released the subject *NOI* seeking comment on the need for receiver performance standards.

On July 7, 2003, the TAC convened a public meeting regarding the measurement and management of spectrum interference.²⁸ The TAC presentations reiterated that there is no current data regarding either the noise floor or current spectrum usage.²⁹ The meeting also

Interference Working Group stressed that the Commission should consider incorporating the interference temperature concept into its future spectrum policy only if this study proves to be successful. Report of the Interference Protection Working Group (“Interference Report”) at 28.

²⁵ SPTF Report at 34.

²⁶ SPTF Report at 53.

²⁷ Commission Seeks Public Comment on Spectrum Policy Task Force Report, Public Notice, FCC 02-322 (Nov. 25, 2002).

²⁸ See Technological Advisory Council (“TAC”) to Hold Meeting, Public Notice, DA 03-1991 (June 17, 2003).

²⁹ FCC TAC, Measurement Technology and Issues, presentation by Robert J. Matheson, NTIA/ITS (July 7, 2003).

established that it is not yet clear whether an interference temperature concept is a valid spectrum management tool and, if so, whether it can be implemented.³⁰

I. AN INQUIRY INTO RECEIVER STANDARDS IS PREMATURE

The SPTF identified receiver performance standards as a transitional mechanism for the implementation of the interference temperature concept.³¹ The Commission specifically references the SPTF Report and the interference temperature concept as the basis for the *NOI*.³² Nevertheless, the Commission has not yet adopted, or even proposed, the interference temperature approach to spectrum management. Moreover, the TAC and the SPTF both identified the need to gain current information regarding the noise floor as a prerequisite to the adoption of rules or policies, such as an interference temperature, that promote additional unlicensed operations.³³ The real-world studies necessary to obtain this information have not yet commenced. Accordingly, the issuance of an *NOI* regarding receiver standards is premature and demonstrates that the Commission is in the midst of a rush to judgment regarding the interference temperature concept.

³⁰ *Id.* An interference temperature policy would establish a signal level below which unlicensed operations would be permitted – these areas are characterized as underlays. During the TAC meeting, the NTIA/ITS presentation identified the following unresolved questions regarding underlays: Can they be constrained to a single band? Can underlay signals be designed to minimize interference to victim receivers? What is the cost versus the benefit of such signals? *Id.*

³¹ SPTF Report at 33.

³² *NOI* at ¶9.

³³ See discussion of TAC findings at pages 4-6 *supra*; SPTF Report at 33, 64-65.

A. Receiver Standards Should Be Addressed Only After the FCC Responds to Comments Received in the Spectrum Policy Task Force Proceeding

The SPTF Report was extremely contentious and numerous parties filed comments, including the Joint Commenters.³⁴ Perhaps the most contentious issue in the report was the recommendation that the Commission utilize the undefined and scientifically unfounded interference temperature concept for spectrum management. If this approach to spectrum management is adopted, the SPTF recommends receiver performance standards as a transition mechanism. Numerous parties opposed the interference temperature concept and the perceived need for receiver standards.³⁵ By moving forward with the instant proceeding, the Commission is prejudging the SPTF proceeding and the interference temperature concept.

B. Receiver Standards Should Not Be Adopted Until a Comprehensive Analysis of the Noise Floor Has Been Completed

The SPTF and the TAC recognized that the first step in evaluating improvements in spectrum management requires a thorough evaluation of the noise floor in each relevant frequency band.³⁶ The *NOI* reinforces the fact that comprehensive noise floor studies must be completed before analyzing potential receiver standards:

³⁴ BellSouth Comments, ET Docket No. 02-135 (July 8, 2002) (“BellSouth Initial Comments”); BellSouth Comments, ET Docket No. 02-135 (Jan. 27, 2003); Cingular Report Comments.

³⁵ See, e.g., BellSouth Initial Comments at 12-13; Cingular Report Comments at 17-31; AT&T Wireless Comments, ET Docket No. 02-135, at 8-18 (Jan. 27, 2003); Motorola, Inc. Comments, ET Docket No. 02-135, at 14 (Jan. 27, 2003); Sprint Corporation Comments, ET Docket No. 02-135, at 13-16 (Jan. 27, 2003); Telecommunications Industry Assn. Comments, ET Docket No. 02-135, at 3, 8-9 (Jan. 27, 2003) (noting that the interference temperature concept was “unproven,” “undefined,” and “dangerous”).

³⁶ See discussion of TAC findings at pages 4-6 *supra*; SPTF Report at 33, 64-65.

[T]he interference environment in which a receiver operates can be highly variable and its characteristics may often be strongly service related. That environment must first be identified and characterized to allow, at least in principle, the development of emission criteria that provide for quantitative comparisons of receiver performance.³⁷

The Commission cannot begin a realistic evaluation of the benefits of receiver standards until the noise floor studies are completed. This evaluation must include an analysis of the noise floor in various environments (*i.e.*, discrete bands of spectrum in varied geographical areas, including urban, suburban, and rural areas) with respect to different services *and* different technologies. For example, a generic receiver standard cannot be adopted for PCS because of the wide variety of technologies that are utilized and the widely varying characteristics of PCS spectrum usage in different environments.

II. THE ADOPTION OF FCC RECEIVER STANDARDS WILL STIFLE INNOVATION BY INCUMBENT USERS AND WILL PROMOTE THE INEFFICIENT USE OF SPECTRUM

In evaluating whether standards are necessary, the Commission first must properly identify the goals the standards would be designed to promote. With respect to receiver performance standards, the *NOI* identifies the more efficient use of spectrum as the main goal.³⁸ Receiver standards will not produce this result, however, with regard to spectrum utilized by existing commercial services and will actually inhibit innovation. Moreover, spectrum efficiency is only one objective of a rational spectrum policy. Other competing objectives would include economically beneficial usage, public safety/homeland security, reliability of communications, and cost.

³⁷ *NOI* at ¶15.

³⁸ *See NOI* at ¶1.

A. Receiver Standards Will Promote Inefficient Spectrum Use

More than “93 percent of all FCC licenses and Federal Government frequency assignments are in the 0 to 3 GHz range.”³⁹ The vast amount of spectrum lies above 3 GHz but contains only 7 percent of all spectrum allocations, which is an inefficient use of available spectrum. Rather than adopt receiver standards for the purpose of packing more users into the heavily congested bands below 3 GHz, the Commission should encourage migration to higher bands.⁴⁰ Farming the fallow spectrum should be a higher priority than subjecting spectrum that is already intensively used to refarming or packing via underlays or easements.

The traditional dividing lines for prime spectrum are rapidly being erased and manufacturers should be encouraged to focus on technologies that will continue to make better use of frequencies above 3 GHz.⁴¹ In July 2000, for example, the Commission held a public forum regarding possible new uses for the 92-95 GHz band and learned that “due to recent technological developments, new uses for this band are approaching practicality.”⁴² Similarly, Loea Communications Corporation has developed a technology capable of transmitting video and teleconferencing on spectrum located above 70 GHz.⁴³ Based on these developments, the

³⁹ Testimony of Nancy J. Victory, Assistant Secretary of Commerce for Communications and Information, NTIA, before the Committee of Commerce, Science and Transportation, U.S. Senate, Hearing on Spectrum Management: Improving the Management of Government and Commercial Spectrum Domestically and Internationally at 8 (June 11, 2002).

⁴⁰ *Accord id.*

⁴¹ See TAC Mandate at 2 & n.4; *Allocations and Service Rules for the 71-76 GHz, 81-86 GHz and 92-95 GHz Bands*, WT Docket No. 02-146, *Notice of Proposed Rulemaking*, FCC 02-180, 17 F.C.C.R. 12182 (June 28, 2002) (“*Millimeter Wave Notice*”).

⁴² See *Millimeter Wave Notice* at ¶2.

⁴³ See *id.* at ¶5.

Commission has proposed new rules for the “millimeter wave” spectrum in the 71-76 GHz, 81-86 GHz, and 92-95 GHz bands and anticipates that technologies initially developed for military and scientific applications will permit these bands to be used for “a broad range of new products and services, such as high-speed wireless local area networks and broadband access systems for the Internet.”⁴⁴ The SPTF recently confirmed that technology developments are making higher frequency bands available for new uses.⁴⁵

Further, receiver standards that are designed to provide additional unlicensed access to the congested spectrum below 3 GHz will not serve the public interest. The perception that easements and underlays are needed to satisfy demand for unlicensed spectrum is fundamentally flawed. For some time, the computer industry has been pushing for access to additional spectrum to satisfy increasing demand for wireless connectivity.⁴⁶ The TAC has openly questioned whether shared spectrum will satisfy these demands:

All signs indicate that wireless connectivity is increasingly seen as an important, if not vital, part of modern life but the increasing demand for various wireless services is tempered by simple economics. Usable spectrum is scarce and therefore incredibly expensive. . . . Unfortunately, shared spectrum use implies mutual interference between systems whose owners, traffic types, or service objectives may be completely different. The prospect of spending development dollars for equipment and services which may be rendered worthless by perfectly legal interference from

⁴⁴ *Id.* at ¶1.

⁴⁵ SPTF Report at 19, 26.

⁴⁶ *See, e.g.*, Letter of Microsoft Corp., ET Docket No. 02-135, at 4 (July 8, 2002) (“Microsoft Letter”); Comments of the Information Technology Industry Council, ET Docket No. 02-135, at 7 (July 8, 2002); Comments of Consumer Electronics Ass’n, ET Docket No. 02-135, at 5-6 (July 8, 2002).

another system has an appropriately chilling effect on technology and service development. . . .⁴⁷

The TAC Report went on to describe this situation as “like a nightmare” because unlicensed operations create the possibility that a business plan could be destroyed by the deployment of a “noise-bomb” application.⁴⁸ It is noteworthy that the SPTF generally opposed the use of underlays below 3 GHz unless secondary markets prove ineffective.⁴⁹

The creation of easements and underlays within already congested spectrum is not the solution to the demand or noise-bomb problems. The solution may lie in the creation of new unlicensed bands that are allocated for certain compatible, broad categories of uses.⁵⁰ The Commission should continue to promote the cultivation of the relatively fallow spectrum above 3 GHz for these uses.⁵¹

Rather than adopt receiver standards and an interference temperature concept that would be designed to add to the congestion below 3 GHz, the Commission should take steps to preclude

⁴⁷ FCC Technological Advisory Council II, Sixth Meeting Report at 14 (Sept. 18, 2002) (“TAC II Sixth Report”).

⁴⁸ A noise-bomb is the deployment of an incompatible service or technology that precludes or damages other uses. TAC II Sixth Report at 15. As Microsoft noted, the current rules for unlicensed uses “permit[] less than optimal use of the available frequencies. Inevitably, where there are virtually no rules of the road and anything is possible, some entrepreneur will design a technology that interferes with other technologies – sometimes because it must, sometimes simply because it is cheaper.” Microsoft Letter at 4.

⁴⁹ SPTF Report at 47, 55, 66-67.

⁵⁰ See Cingular Report Comments at 14-17.

⁵¹ Proponents of underlays would benefit if the Commission set aside additional spectrum for unlicensed use above 3 GHz. Such an approach would promote additional innovation above 3 GHz. Although underlay proponents would bear the costs of developing new technologies for these bands, it is a more equitable approach compared to shifting the costs for underlay services to incumbent licensees.

additional usage in those bands. By taking such action, the Commission will give manufacturers an incentive to focus their development dollars on equipment that would operate on uncongested spectrum in higher bands. As the Commission learned in the E911 context, the technologies necessary to provide a service will develop when there are no alternative solutions.⁵² This approach also would allow manufacturers to continue to improve upon the performance of equipment (*i.e.*, receivers) in the existing bands below 3 GHz and thus improve spectrum efficiency in these bands. It would provide the industry with a predictable environment in which to design a receiver and recover the costs of this design and subsequent manufacturing. Furthermore, allowing higher and higher levels of noise and interference may actually hinder the development of improved receivers and will only result in users asking for higher transmit power levels which, in turn, would result in higher levels of interference and increase costs. The cycle of ever-increasing levels of noise and interference must be contained.

B. Receiver Standards Will Stifle Innovation

In determining whether to adopt receiver standards, the Commission must balance two mutually exclusive objectives: (i) incentives for invention and innovation that will give rise to more services and applications available from incumbent licensees; and (ii) the introduction of different products and services available on an unlicensed basis. By choosing to promote the

⁵² In ET Docket 94-102, the Commission adopted rules that required CMRS carriers to provide detailed location information for 911 calls. At the time of adoption, however, the rules could not be satisfied without further technological advancement. *Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems, Request for Waiver by Cingular Wireless LLC*, CC Docket No. 94-102, *Order*, FCC 01-296, at ¶ 6 (rel. Oct. 12, 2001) (citing *Fourth Memorandum Opinion and Order*, 15 F.C.C.R. 17442, 17457-58 (2000)).

latter objective, the Commission would be determining winners and losers with respect to the wireless marketplace.

The Commission appears to presume that licensed networks will be designed to perform only above the peaks in the noise floor and that spectrum available in the “valleys” will lie fallow unless an interference temperature (and underlay) is established. Under the Commission’s thesis, receiver standards would facilitate the creation of these underlays. However, they also would effectively prevent incumbent, licensed carriers from utilizing dynamic receivers that would be capable of adjusting their performance levels based on the noise level at a specific location. Many existing communications networks operate in this manner. Cellular and PCS networks are able to provide wider area service, or serve more customers, when noise levels are below their peak. These systems rely on the dynamic variations in the noise level to provide their current level of service.

If underlays are permitted to operate up to the peak noise level, network performance (coverage, capability, and reliability) would suffer to the detriment of consumers. Thus, if adopted, this gambit would create two large and significant classes of losers: (i) incumbent licensees because they would be unable to take full advantage of the spectrum assigned to them; and (ii) the members of the public who rely on the existing services provided over this spectrum. Incumbent systems and handsets would have to be re-designed at significant cost to accommodate underlay operations and licensees would be precluded from taking advantage of new technological developments that would permit operations closer to the noise floor – levels that may have been previously deemed impossible. Incumbent licensees (and consumers) also would lose because more robust receivers will cost more. Rather than serving more customers through the deployment of improved receivers, licensees may need improved infrastructure solely to maintain current levels of service in the face of increasing levels of interference.

Receiver performance requirements, however desirable, could be self-defeating if they increase the costs and weight associated with a handset and thereby diminish customer acceptance of the “improved” handsets.

Conversely, parties seeking to avail themselves of underlays will win at the expense of incumbent licensees. Specifically, incumbent licensees and their subscribers will incur the substantial costs associated with redesigning systems and purchasing more expensive receivers necessary to permit underlay operations whereas underlay service providers will have free access to underlay spectrum and will have their development costs substantially reduced.

Rather than choose winners and losers, the Commission should refrain from imposing receiver standards on commercial wireless services and authorizing underlays. By exercising restraint, the Commission would preserve the existing incentives for incumbent licensees to use spectrum efficiently and to innovate. Without FCC involvement, the CMRS industry has evolved from an analog service to a digital service, using spectrum more efficiently to serve a continually growing customer base with a fixed amount of spectrum. At the same time, the services offered have expanded tremendously. Whereas Broadband CMRS carriers once offered only basic cellular service, they now offer short messaging services, multimedia messaging, gaming platforms, Internet access, and location-based services, with many more innovative services on the planning horizon.

III. TO THE EXTENT VOLUNTARY STANDARDS EXIST, THEY SHOULD NOT BE IGNORED BY THE COMMISSION

The Commission should not get involved with setting receiver standards for commercial services. The wireless industry has already established such standards where necessary to improve performance and efficiency. The standards for GSM and UMTS receivers have been accepted internationally and are readily accessible via the web. For example:

- GSM/EDGE Radio Access Network, Radio Transmission and Reception, 3GPP TS 45.005, Version 6.2.0, April 2003, www.3gpp.org/ftp/Specs/html-info/45005.htm;
- UMTS Radio Access Network, User Equipment Radio Transmission and Reception (FDD), 3GPP TS 25.101, Version 6.1.0, June 2003, www.3gpp.org/ftp/Specs/html-info/25101.htm; and
- UMTS Radio Access network, Base Station Radio Transmission and Reception (FDD), 3GPP TS 25.104, Version 6.2.0, June 2003, www.3gpp.org/ftp/Specs/html-info/25104.htm.

The danger associated with adopting new receiver standards is that they will become “maximum” standards. In other words, standards of performance will become the lowest common denominator, eliminating the potential benefits of developing equipment engineered to higher standards because spectrum users would only have protection based upon the FCC-established standards.

The *NOI* touts voluntary receiver standards as a method for improving spectrum efficiency and creating opportunities for new uses. Unfortunately, it appears that industry standards are only persuasive to the Commission when they facilitate band packing. In a variety of recent proceedings, the Commission has ignored or rejected industry standards because they stood in the way of new and emerging technologies. For example, in the UWB proceeding the Commission dismissed as “unrealistic” industry standards that were supplied regarding CDMA and it ignored data supplied regarding industry standards for TDMA.⁵³ Similarly, the Commission disregarded industry standards for basic cellular design that would have precluded a new service proposed by AirCell on interference grounds in favor of a new standard developed

⁵³ *Revision of Part 15 of the Commission’s Rules Regarding UWB*, ET Docket 98-153, *Memorandum Opinion and Order and Further NPRM*, 18 F.C.C.R. 3857 (2003).

by the Commission that swept away the interference issue.⁵⁴ In both proceedings, the Commission also failed to consider the impact these new services would have on innovation by incumbent licensees.

If voluntary standards are going to be useful, they must be respected by all parties – including the Commission. Billions of dollars have been (and continue to be) spent designing systems based on voluntary industry standards and these investments are undermined when the standards are disregarded by the Commission. By sweeping aside these standards, the Commission is undermining incentives to innovate. Companies will not want to invest in innovations made possible by new standards if these standards are likely to be ignored by the one entity capable of protecting them – the Commission.

IV. RECEIVER STANDARDS CANNOT BE VIEWED IN ISOLATION AND IMPOSE COSTS ON INCUMBENT LICENSEES AND USERS

The *NOI* seeks information that would facilitate the creation of receiver performance standards that would limit a receiver’s susceptibility to interference.⁵⁵ The Commission correctly identifies factors that can be used to evaluate a receiver’s immunity from interference: selectivity, sensitivity, dynamic range, automatic RF gain control, shielding, modulation method,

⁵⁴ See *AT&T Wireless Services, Inc. v. FCC*, 270 F.3d 959 (D.C. Cir. 2001) (*AWS v. FCC*), *remanding AirCell, Inc.*, 15 F.C.C.R. 9622 (2000) (“*AirCell Order*”), *aff’g AirCell, Inc.*, 14 F.C.C.R. 18,430 (WTB 1999) (“*Reconsideration Order*”); 14 F.C.C.R. 806 (WTB 1998) (“*Bureau Order*”).

⁵⁵ See *NOI* at ¶¶1-2.

and signal processing.⁵⁶ Unfortunately, none of these factors is a “silver bullet” for all interference.

In evaluating methods for improving receiver performance, the Commission must distinguish between improvements in out-of-band interference and co-channel interference. Although filters could be added to a receiver to improve receiver selectivity, they have no impact on co-channel interference.⁵⁷ For example, over the past several years, the Commission has had a number of proceedings in which the provision of new and improved wireless services was delayed or impaired by interference concerns. In the 700 MHz auction proceeding, potential bidders discovered that the ongoing presence of high-powered television transmitters in the spectrum targeted for auction would destroy the utility of the spectrum for new and advanced *services* – even if these systems used advanced filters, employed the most modern transmitter and receiver designs and operated on adjacent channels. While improved receiver performance might reduce the impact of the incumbent television transmitters, even the most modern and expensive receivers could not make the band useful for other services. These factors must be weighed carefully in terms of the technical and economic impacts on the receiver equipment and the entire radio system.

The Commission also should recognize that substantial improvements in receiver performance generally cannot be made without corresponding network changes. For example, the *NOI* cites signal processing as a method for improving a receiver’s immunity from

⁵⁶ *NOI* at ¶12. At times, however, the Commission appears to mistakenly characterize CDMA as a modulation method for improving receiver immunity to interference. *See id.* at ¶¶13-14.

⁵⁷ The use of filters to substantially improve selectivity may cause other problems such as increased insertion loss within the desired passband.

interference.⁵⁸ While improvements in performance may be possible through the use of advanced signal processing in the receiver, in many cases performance cannot be improved simply by altering receiver specifications. Changes to the signal processing (*e.g.*, forward error correction coding, processing gain, modulation) must be implemented as part of a comprehensive system design or re-design; improvements in signal processing require changes to both system *transmitters* and receivers. For example, if the transmitter supports only a rate 1/3 convolutional code, there is no reason (or benefit) to require the receiver to support other code rates; the receiver can only decode at the rate of the transmitted signal.

The Commission should be mindful that advanced system design (*i.e.*, receiver, transmitter, modulation, air interface, and network) is a series of trade-offs. The Commission substantially oversimplifies this balancing of competing factors. For example, the FCC states that digital systems are more robust and resistant to interference.⁵⁹ In fact, digital coding techniques can be, and are, designed to achieve a variety of objectives, not only resistance to interference. In many cases, the robustness of digital system design has been used to increase the capacity of a link in an environment under network control (*i.e.*, where self-interference can be managed by design, and there are no significant sources of external interference) or to correct multipath fading, instead of being devoted to increase the jamming margin of a link to protect it from external interference. If external interference is added, the “robustness” of digital technology will not magically provide immunity from this interference. The system would have to be re-designed for a different trade-off between capacity and interference protection. In other

⁵⁸ *NOI* at ¶13.

⁵⁹ *NOI* at ¶8.

words, the introduction of a new source of interference would ultimately reduce capacity, quality, and coverage.

Moreover, improvements in receiver immunity have at least two distinct costs – they increase the cost of the receiver and may actually impair the spectral efficiency that can be achieved.⁶⁰ Techniques that require additional processing capabilities add to the cost and complexity of equipment and reduce the battery life of receivers. Such “improvements” also can reduce the data throughput (link speed) of the wireless link, thereby reducing efficiency.⁶¹ A greater proportion of spectral usage is devoted to overhead data used for such processing, with the user data packed into a more heavily “padded envelope” to protect it from interference. As a result, net spectral efficiency can be greatly reduced.⁶²

Similarly, although it may be possible to substantially improve the interference immunity of a receiver, consumers must be willing to bear the cost of such improvements. Thus, “possible” improvements must be weighed against consumer tolerance for more expensive receivers.⁶³ As a result of these factors, carriers may not deploy cutting edge developments that

⁶⁰ *Accord NOI* at ¶10.

⁶¹ For example, in spread spectrum systems the processing gain can be used to improve interference tolerance. Processing gain, however, is defined as the chip rate divided by the bit rate. Since the chip rate must be chosen so that the radio signal will be contained within the desired channel bandwidth, it is a standard system design parameter and remains unchanged. Thus, to increase processing gain, it is necessary to decrease the bit rate which, in turn, decreases the efficiency of the spectrum use. Similarly, although error-correcting codes, such as convolution codes and turbo codes, can be used to mitigate interference, these codes reduce the capacity for user data available on a link.

⁶² For a more detailed discussion of the impact of external interference on CDMA, *see* Lucent Technologies Comments, ET Docket No. 02-135 at 2-4, Annex A (Jan. 27, 2003).

⁶³ The willingness of a consumer to absorb additional receiver costs varies widely. The ability to absorb costs also varies by industry. For example, a small public safety
(continued on next page)

may improve receiver immunity until the cost of the new receivers decreases and offsetting techniques are available for maintaining system performance. The Commission cannot ignore these costs when considering the need for receiver performance standards.⁶⁴

V. LEGACY HANDSETS MUST BE PROTECTED IF NEW PERFORMANCE STANDARDS ARE ADOPTED

The *NOI* seeks comment on the treatment of legacy handsets if new receiver performance standards are adopted.⁶⁵ The Commission suggests that one approach would be to afford no protection to legacy receivers because users would simply change to compliant handsets once they experience interference. Such an approach should be rejected for commercial services because it would create havoc. In the CMRS context, for example, consumers would associate any new interference with poor carrier performance. They likely will be skeptical of carrier claims that a new handset will solve the interference problems and, at a minimum, will expect the carrier to absorb the cost of the new handset. Thus, if the interference temperature concept is adopted, a transition period should be established during which legacy handsets are entitled to interference protection. This period should be long enough to take into account the design, development, and testing of new receivers as well as any required network changes. In addition, five years should be allowed for customers to migrate from their legacy handsets.

communications system with a limited number of handsets will find it easier to absorb a \$2 price increase per handset than would a nationwide CMRS carrier with millions of handsets in service.

⁶⁴ *Accord NOI*, Separate Statement of Commissioner Copps at 1 (stating that the Commission “must also understand the costs of designing more robust receivers”).

⁶⁵ *NOI* at ¶¶39-40.

CONCLUSION

For the reasons set forth above, the Commission should terminate its inquiry into receiver performance standards until the SPTF proceeding is completed and comprehensive, current data regarding the noise floor is compiled. If the Commission moves forward, it must balance the costs such standards would impose on existing service providers and their subscribers and must adopt an adequate transition period to protect legacy handsets from interference.

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