Before the
Federal Communications Commission
Washington, D.C. 20554

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

NOTICE OF INQUIRY

Adopted: March 13, 2003 **Released: March 24, 2003**

Comment Date: [75 days from publication in the Federal Register]
Reply Comment Date: [105 days from publication in the Federal Register]

By the Commission: Chairman Powell, Commissioners Abernathy, Copps, Martin and Adelstein issuing separate statements.

I. INTRODUCTION

1. By this action, the Commission begins consideration of incorporating receiver interference immunity performance specifications into our spectrum policy on a broader basis. Such specifications could be in the form of incentives, guidelines or regulatory requirements (or a combination of these) in particular frequency bands, services or across bands and services. We believe that incorporation of receiver performance specifications could serve to promote more efficient utilization of the spectrum and create opportunities for new and additional use of radio communications by the American public. From a technical standpoint, a radio receiver's susceptibility to interference is largely dependent on the interference immunity of the device, particularly with regard to its rejection of undesired radiofrequency (RF) energy and signals. If the receivers used in connection with a radio service are designed to provide a certain immunity or tolerance of undesired RF energy and signals, more efficient and predictable use of the spectrum resource can be achieved. Such receiver improvements could also provide greater opportunities for access to the spectrum. These opportunities will potentially lead to consumer benefits in the form of innovation, competition and choice among services and devices.

2. Increasingly in recent years, the preemptive effect of minimally performing receivers has been demonstrated, as licensees seek protection for service predicated on the performance of receivers with little tolerance for other signals. Had the RF environment in which these services would be expected to operate in the future, or the expected performance characteristics of those receivers, been defined in some way, these services could have been developed with receivers that could better tolerate the introduction of newer services on the same or proximate frequencies. Accordingly, in this Inquiry we seek information, comment, and research on issues concerning the current receiver environment, *i.e.*, the immunity performance and interference tolerance of existing receivers, the possibilities for improving the level of receiver immunity in the various radio services, and the potential positive and negative impacts of receiver standards on innovation and the marketplace. We also request comment on the possible approaches by which desired levels of receiver immunity or tolerances could be achieved, including incentives for improving performance, voluntary industry standards, mandatory standards, or a combination of these or other approaches. In this regard, it is not our intent at this time to implement a new regulatory regime that would generally subject all receivers to mandatory standards. Rather, we believe it is preferable to rely primarily on market incentives and voluntary industry programs that

provide for flexibility in establishing and managing guidelines for receiver immunity, rather than formal mandatory standards incorporated into our rules. At the same time, we note that in the past the Commission has mandated various transmitter standards in order to control interference levels. As we recognize that receivers can contribute as much as transmitters to the existence of perceived interference, there may be benefits to the adoption of guidelines, labeling rules, or even mandatory standards for certain classes of receivers. This may be particularly relevant in situations where we continue to find that command and control spectrum management techniques are in the public interest [e.g., public safety] or in situations in which it is not possible for all the relevant industry and consumer parties to reach voluntary agreements.

3. We further request information and comment on the considerations that should guide the Commission's approach to these matters in the various licensed radio services. This proceeding builds upon recent work of the Spectrum Policy Task Force (Task Force) to examine means for improving the management of the radio spectrum to increase the public benefits derived from use of the spectrum resource.[1] In its Report, the Task Force concluded that the increases in demand for radio services in the limited amount of available spectrum and the rapid advances in radio system technologies, including new digital transmission systems, in recent years are necessitating that the Commission change its traditional model for managing the radio spectrum. The Task Force observed that greater opportunities for spectrum access would be facilitated if the minimum performance characteristics of the receiver were known and therefore recommended that we make receiver performance a more prominent part of our spectrum policy.[2] In response to the Task Force report, a number of parties expressed their support for receiver standards and guidelines developed by industry standards groups.[3] Several parties expressed support for Commission mandated requirements for certain receivers.[4] Other parties oppose mandated receiver standards and guidelines.[5]

II. DISCUSSION

4. The principal limiting factor in the allocation and assignment of radio frequencies is interference to received signals. Radio interference can occur when RF energy other than a desired signal is present in a receiver. Such undesired energy can be present from the emissions of one or a combination of other sources generating RF energy[6] or can be generated within the receiver itself. Interference occurs when undesired RF energy is manifested in a radio communication system as a performance degradation, misinterpretation, or loss of information that could be extracted from a desired signal in the absence of the

[1] *See Spectrum Policy Task Force Report* ("*Task Force Report*"), ET Docket No. 02-135, November 15, 2002, at p. 1.

[2] *See "Spectrum Policy Task Force, Report of the Interference Protection Working Group,"* ET Docket No. 02-135, Federal Communications Commission, November 2002, at pp. 24-28. On November 25, 2002, the Commission issued a public notice, FCC 02-322, inviting public comment on the Task Force report. Twenty parties filed comments specifically addressing the issue of the minimum performance characteristics of receivers.

[3] *See* Lucent Technologies comments at 5, National Public Radio comments at 10, Proxim Corporation comments at 5, and United Telecom Council comments at 6. The Commission's authority to impose mandatory receiver standards is discussed, infra, at P 22.

[4] *See* Maximum Service Television, Inc./The National Association of Broadcasters comments at 19, Agere Systems comments at 7, IEEE 802.18 comments at 7 and Public Safety Wireless Network comments at 9.

[5] *See* Consumer Electronics Association comments at 6, Motorola, Inc. comments at 15 and Qualcomm, Inc. comments at 5.

[6] Sources of undesired RF energy can include intentional radiators, *e.g.*, transmitters, unintentional radiators, *e.g.*, receivers, computers and other devices that use RF energy internally but do not radiate that energy as part of their operating functions, and incidental radiators that unintentionally generate and emit RF energy.

unwanted energy.[7] The adverse effects of undesired energy present in a receiver can be minimized by improved design of the receiver.

5. The Commission's radio spectrum policies and rules, including its efforts to promote spectrum efficiency, traditionally have relied primarily on approaches that control the emissions and locations of transmitters and the frequencies used by specific types of radio operations. Under this model, the Commission has established operational parameters in given portions of the spectrum in which the pattern of radio signals, both geographically and technically, is well understood and generally predictable by equipment manufacturers and licensees. Manufacturers could design and market products for designated services within these parameters and the predicted environment. In some services, licensees could choose the transmitter and receiver products that best meet their particular needs for the provision of radio communication services. In other services, including broadcast radio and television services, receiver products are designed and marketed for a mass consumer market, with the licensees having limited control or influence over their technical parameters and capabilities. Therefore, to some extent our existing rules, such as the TV allotment table, while limited to transmitting requirements, also assume certain levels of receiver performance.

6. Generally, this model has served well to control interference and to facilitate effective use of the spectrum in environments in which the specific services and operating technology are stable and very well defined. However, as recognized in the *Task Force Report*, the dramatic increases in the overall demand for spectrum based services, rapid technical advances in radio systems, in particular the introduction of various advanced digital modulation technologies such as code division multiple access (CDMA), and the need for increased access to the limited supply of spectrum in recent years are straining the effectiveness of the Commission's longstanding spectrum policies.[8] These changes are prompting the Commission to revisit its traditional model and evolve its spectrum policy toward more flexible and market-oriented approaches that will provide incentives for users to migrate to more technologically innovative and economically efficient uses of the spectrum.

7. We now need to provide opportunities for an ever increasing array of new digital radio technologies and services and to allow licensees the flexibility to implement and modify these new technologies and services in accordance with market forces. We also need to relieve equipment manufacturers and service providers from the delays inherent in our regulatory processes, in particular, those involving lengthy rule makings. To meet these needs, we have implemented new licensing schemes under which bands of spectrum are assigned to licensees on a geographic basis and those licensees are allowed the flexibility to determine the nature of the services that operate in that spectrum and the technologies used to provide those services. The only operating restrictions applied to these operations are those necessary to ensure that interference is not caused to services operating in adjacent geographic areas or on adjacent frequency bands. These restrictions typically take the form of limits on signal strength at the edge of a licensee's service area and limits on maximum transmitter power, antenna height and out-of-band emissions.

8. As a result of the above changes, it often is not possible to perform a reliable, comprehensive analysis to predict the strength of potential signal sources in a given frequency band and geographic area because licensees have discretion to select and modify transmitter locations, operating power, antenna directivity and type of transmissions. In addition, we observe that new digital technologies generally are inherently more robust, and resistant to interference, than analog systems.[9] Our spectrum policies should account for this increased ability of digital signals to tolerate the presence of other signals. Further, with

[7] This is the definition of interference in Section 2.1 of the rules, 47 C.F.R. § 2.1.

[8] *Task Force Report*, at pp. 11-15.

[9] For example, channel coding, data coding, and error correction coding can be applied to digital signals to improve transmission reliability and performance in the presence of noise or interference.

the increasingly intense use of the spectrum, there are now very few opportunities to allocate unused spectrum for new services and correspondingly, few bands in which there are not many users seeking to access the available frequencies. Thus, as indicated in the *Task Force Report*, interference management is now more difficult because of the greater density, mobility, and variability of transmitters and our flexible use policy that allows users the flexibility to determine how and where to operate in their assigned spectrum.[10]

9. As part of our effort to revise our spectrum management policies to address the changes in RF operations and environments that have occurred in recent years, we are now beginning to investigate alternative approaches for managing interference. Consistent with the recommendations of the Task Force, we believe it will be necessary to shift our current paradigm for assessing interference from approaches based primarily on transmitter operations towards new approaches that focus on the actual RF environment and interaction between transmitters and receivers, such as the interference temperature metric.[11] Such new approaches would better allow the Commission to anticipate and enable future users of the spectrum while providing a greater degree of certainty to incumbents regarding the RF environment they will continue to operate in.[12]

10. In many cases, the effects of RF interference can be mitigated or eliminated through attention to receiver hardware design and signal processing software. There are many attributes of receiver performance that can be varied to increase a device's immunity to undesired emissions, and standards could be established for minimum performance requirements. Improving the general level of receiver performance with respect to interference immunity would allow increased operation of radio services on adjacent channels and frequency bands and thereby promote spectrum sharing and radio system interoperability that would permit more efficient use of the spectrum. In addition, more robust receiver performance would help to facilitate more flexible use of the spectrum. Such robust performance would allow receivers to tolerate changes in operating systems, services and frequency loading that are expected to occur under flexible use of the spectrum. At the same time, however, we recognize that improvements in receiver performance almost always increase production costs, and so there are trade-offs in costs and performance that must be balanced. In addition, we need to address how the benefits of upgraded receiver performance would be distributed among users. For example, improved receiver immunity may permit government operations over wider areas or at higher powers without causing interference.

11. In this proceeding, we seek additional information on the broad range of issues relating to the possible incorporation of receiver performance incentives, guidelines or standards. As discussed below, we invite interested parties to submit information, research, and comment on subjects including: potential receiver performance parameters, the manner in which receiver immunity performance capabilities should be incorporated into our spectrum policies and rules, including the scope of our authority to establish mandatory receiver standards by rule[13]; possibilities for use of receiver interference immunity

[10] *Task Force Report*, at pp. 26-27.

[11] *Task Force Report* at pp. 27-30.

[12] The Task Force identified several long term goals for a comprehensive framework for optimizing spectrum management in the future. In the near term, it recommends that the Commission consider establishing receiver performance requirements to supplement its transmitter-centric interference management approaches. The Task Force noted that the use of modern receiver filtering and digital system processing could enhance interference management in the near-term, while the interference temperature concepts are being developed. Interference temperature is a measure of the RF power available at a receiving antenna per unit bandwidth. The interference temperature metric could be used to establish maximum permissible levels of interference, thus characterizing the "worst case" environment in which a receiver would be expected to operate. Different threshold levels could be set for each frequency band, geographic region or service based on the RF environment in each band. The Commission intends to consider the use of interference temperatures for managing interference in a separate proceeding.

[13] We believe the Commission has the necessary statutory authority to promulgate receiver immunity standards and guidelines. *See* P 22, infra.

performance guidelines and standards in specific radio services; the impact of receiver minimum immunity performance requirements on innovation and the marketplace; the current receiver environment; and transition issues such as the treatment of legacy receivers.

A. Receiver Performance Parameters

12. A radio receiver's immunity to interference is dependent on a number of factors in its technical design and, in addition, the characteristics of the signals it receives. These factors may be closely related and in many cases interdependent, and a receiver's performance in one factor may often affect its performance in others. The factors determining receiver immunity performance generally include selectivity, sensitivity, dynamic range, automatic RF gain control, shielding, modulation method, and signal processing,. Receiver selectivity is the ability to isolate and acquire the desired signal from all of the undesired signals that may be present on other channels. Selectivity is a central factor in the control of adjacent channel interference.[14] Sensitivity is the measure of a receiver's ability to receive signals of low strength. More sensitivity means a receiver can pick up lower level signals.[15] Dynamic range is the range of the highest and lowest received signal strength levels over which the receiver can satisfactorily operate. The upper side of a receiver's dynamic range determines how strong a received signal can be before failure due to overloading occurs. Automatic RF gain control allows a receiver to adjust the level of a received signal as it appears at the unit's signal processing and demodulation sections. It can also be used to improve a unit's dynamic range and provide protection against overload. Shielding can consist of metal boxes, foil or other materials that isolate sections of a receiver from undesired RF energy.

13. Signal processing provides increased ability to isolate a desired signal from other RF energy, including another (undesired) transmitted signal. The degree to which interference immunity can be achieved through signal processing depends on the modulation method used for the transmitted signal. For example, the CDMA digital modulation system allows multiple signals to be transmitted and received simultaneously on the same frequency in the same area without intra-system interference.[16] The analog FM modulation system provides for a "capture effect" from processing gain that allows a receiver to demodulate only the strongest signal present. Finally, in digital systems, trade-offs can be made between signal strength and data rates. In order to receive signals with higher data rates, it is generally necessary to have higher levels of signal-to-interference ratio (S/I ratio).[17] Thus, in the presence of interfering

[14] There are several ways to describe the selectivity of a radio receiver. One way is to simply give the bandwidth of the receiver over which its response level is within 3 dB of its response level at the center frequency of the desired signal. This measure is often termed the "bandwidth over the -3db points." This bandwidth, however, is not necessarily a good means of determining how well the receiver will reject unwanted frequencies. Consequently, it is common to give the receiver bandwidth at two levels of attenuation; for example, -3dB and -60 dB. The ratio of these two bandwidths is called the shape factor. Ideally, the two bandwidths would be equal and the shape factor would be one. However, this value is very difficult to achieve in a practical circuit.

[15] Greater sensitivity can also result in reception of unwanted signals a low levels that then must be eliminated or attenuated by the selectivity characteristics of the receiver.

[16] In order to make more efficient use of the spectrum, radio system designers have introduced a number of additional new modulation formats. These include continuous phase modulation (CPM), multiple phase shift keying (MPSK), and quadrature amplitude modulation (QAM).

[17] The trade-off between data rate and signal strength is in accordance with Shannon's Law, a mathematical statement defining the theoretical maximum information rate that can be transmitted over a specific amount of bandwidth in the presence of noise. For digital transmissions, this translates into the maximum number of bits per second that can be transmitted, error free, in a specific amount of bandwidth at any specific ratio of received signal to noise. Error-correction codes can improve the communications performance relative to un-coded digital transmissions, but no practical error correction coding system exists that can achieve the theoretical performance limit given by Shannon's law. However, a new class of forward error correction (FEC) codes known as "turbo codes" has been introduced that can simultaneously improve data throughput and reduce the error rate.

signals the data rate could be adjusted to provide satisfactory reception. The interference immunity provided by signal processing and modulation systems is due to radio system design and signal architecture, rather than specific receiver attributes such as filtering. However, because proper use of these system factors can provide improvements in interference immunity, we are including them in the subjects to be investigated in this proceeding for inclusion in our spectrum policies.

14. We request comment and information on the factors or combination of factors and their interaction that we need to consider in developing receiver interference immunity performance guidelines and standards, as well as the costs and benefits of such guidelines and standards. We specifically request comment on the factors affecting interference immunity we have identified above and their relative importance. We also invite parties to identify additional factors that we should consider in establishing and applying receiver immunity standards. We also seek comment and information in response to the following questions:

- Are there any special hardware designs, software methodologies, or new technologies available that would significantly enhance receiver immunity performance?

- How are these performance factors related to frequency and operating power, and influenced by the nature of the RF environment?

- To what extent, and in what way, are some factors affecting interference immunity relatively more important than others across receivers used with different services or across devices that receive signals transmitted using different modulation methods?

- Are there factors that must be considered as a group and not independently due to their cross-interactions or relationships with other factors?

- Are some factors less important in providing interference immunity in certain modulation systems or receiver designs?

- How should any such differences be treated in specifying receiver immunity guidelines or standards?

- Can receiver interference immunity parameters be ranked in accordance with their level of importance to performance? What procedures or criteria should be used to determine how to trade off the level of receiver performance with the practical issues of cost and implementation?

- Should system characteristics such as signal processing gain and modulation methods that facilitate immunity from interference in receivers be considered germane to the process of establishing receiver performance guidelines or standards?

- Do new and emerging advanced radio systems, including those employing digital modulation, offer potential for significantly improving receiver immunity to interfering signals? What are the inherent performance limitations of these technologies?

15. As mentioned above, the 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. We request comment on the following questions concerning the interference environment in which receivers operate:

- What are the characteristics of the RF environment in which existing receivers or groups of receivers operate?

- If studies were to be carried out, what would be an efficient way to capture any relevant data or pertinent events given the dynamic changing nature of the environment over time?

- Should different receiver specifications or approaches be taken based on the environment in which the receiver is expected to operate (for example, high-powered or lower-powered frequency bands).

16. Another approach to describing the interference environment would be to develop a generic environment in which all receivers would be expected to perform adequately. Once the environment was identified, criteria directly related to receiver performance in that environment could be established. One way to measure performance would be to look at the signal to noise levels (S/N) of analog systems and the bit error rate (BER) of digital systems. These metrics are quantifiable, but specific levels or ranges would have to be developed. Another approach to receiver performance quantification would be to use generally agreeable criteria that have come about over years of development and interaction with equipment and the marketplace. For example, the 55 dB attenuation standard for adjacent channel protection by cable compatible consumer electronics equipment in Section 15.118(c)(1) was set based on manufacturers' experience with such equipment and their knowledge of the tolerance of equipment suppliers for that level of performance.[18] We request responses to the following questions relating to the establishment of a generic receiver environment and possibilities for measuring receiver performance there under:

- If a generic environment were employed, how many conditions would have to be considered to cover the variability of the natural environments, (*i.e.*, narrow band, wide band, closest frequency separation for interferer and carrier, etc.)?

- What measures of performance translate into good, acceptable, or poor operational metrics?

- Could manufacturers agree on performance categories and could quantifiable ranges be established for these categories? How many categories would be needed and where should the threshold for acceptable performance be set among those categories?

17. Digital technologies, in particular, provide flexibility for controlling almost all aspects of transceiver performance.[19] Many receiver parameters can be software controlled, perhaps in response to specific interference in the signal environment. One example is frequency agile transceivers with automated transmitter power and frequency control. The design of the systems that these transceivers are used with provides for control of the frequency and signal strength used for operation. Advanced antenna technology coupled with system design techniques such as diversity, in terms of space, angle, frequency and time could also be used to enhance reception. We seek comments on whether and how system design elements that would enhance radio receiver performance should be incorporated into our receiver guidelines/standards program. In particular we seek comment on the elements of system design that should be included in receiver guidelines/standards and how we could limit the impact of receiver guidelines/standards on system design flexibility.

B. Incorporation of Receiver Interference Immunity Performance Guidelines and Standards into Spectrum Policy

18. We seek information and comment on how best to incorporate receiver interference immunity performance specification into our paradigm for management of the radio spectrum. Initially, we envision that there could be three principal approaches for implementing measures for improving receiver

[18] *See First Report and Order* in ET Docket No. 93-7, 9 FCC Rcd 1981(1994), at ¶¶ 92-94.

[19] A transceiver is a device that has both transmit and receive functions for "two-way" communications. For example, cellular radio handsets (and base stations) are transceivers.

performance: voluntary industry standards; guidelines promulgated by the Commission, either in technical publications or as advisories in the rules; and mandatory standards adopted into the rules. As a general matter, we would prefer to rely primarily on voluntary programs that are supported and managed by industry, in conjunction with user groups as appropriate, to establish and maintain guidelines and standards for receiver immunity performance, rather than formally incorporate them into our regulatory programs.[20] We believe that this approach provides the greatest flexibility for those developing and producing products to modify and update technical guidelines and standards in response to changes in technology, consumer desires, and economic conditions. We also believe that spectrum users have an incentive to reach voluntary agreements that provide for additional spectrum use. For example, the PCS industry has developed more rigorous standards than the Commission has imposed. On the other hand, we recognize that under a voluntary approach, if owners of non-conforming receivers experience interference, this might produce an incumbency problem that may limit efficient use of the spectrum. We seek comment on these issues.

19. At the same time, we will need to maintain a cooperative relationship with those managing voluntary standards to ensure that they provide the performance levels necessary to support more efficient use of the radio spectrum. There may also be instances where for various reasons it might be necessary or desirable for the Commission to exercise a greater role in the development and management of guidelines or standards. In such cases we would prefer an approach by which the Commission would maintain the specified guidelines or standards in either an FCC technical publication, such as the "OET Bulletin" series or an advisory in the rules. Finally, there may be some cases where it will be necessary to incorporate the specifications of the standard into our rules. We request comment on the following questions with regard to the manner in which to incorporate receiver guidelines and standards into our rules:

- What approaches should the Commission use for implementing receiver immunity performance into its spectrum policies? Commenting parties are specifically invited to submit additional measures to augment the three approaches suggested above or to suggest completely different plans.

- What benchmarks should the Commission use in determining the approach it should use in implementing specific receiver interference immunity performance guidelines or standards into its spectrum policies?

- With what organizations should the Commission work with to develop receiver performance requirements?

- How should standards or guidelines be implemented for services in which licensees have control over the receivers that are used, such as the cellular and PCS services, and in which they do not have control over the receivers, such as broadcast services?

- What are the cost implications of the various options for approaches for incorporating receiver interference immunity into our spectrum policies in terms of both cost of equipment and flexibility for users/system designers?

- We also seek comment on how to enforce any receiver standards.

[20] *See 2000 Biennial Regulatory Review of Part 68 of the Commission's Rules and Regulations, Report and Order* in CC Docket No. 99-216, 15 FCC Rcd 24944 (2000). In that proceeding, the Commission determined that accredited standards development organizations should be responsible for establishing technical criteria to ensure that telephone terminal equipment does not cause harm to the public switched telephone network and eliminated the detailed regulations in the rules for such equipment. The Commission's rules continue to proscribe harm to the public switched telephone network, but a private industry committee is responsible for compiling and publishing all standards adopted as technical criteria for terminal equipment.

20. We also request comment on the criteria that should be used in determining how to specify the form of immunity guidelines or standards. Guidelines/standards can be in the form of performance criteria that apply to the functional capabilities of a device or of design specifications for the manufacture of portions of a device. In general, we believe it is desirable to continue the Commission's traditional preference to specify guidelines/standards as performance criteria, and to make such guidelines/standards voluntary rather than mandatory. This approach gives manufacturers freedom to design the internal configurations of their products to compete on both price and functionality. However, there may be instances where it would be more appropriate to specify guidelines/standards for the design of some or all of the features of a device that affect interference immunity. We request comment on the forms in which we should specify receiver interference immunity performance guidelines/standards and invite commenting parties to submit suggestions for alternative forms of specifying receiver interference immunity performance guidelines/standards. We also request comment on the circumstances under which any given form should be employed. Finally, we ask how should the public be informed of the interference immunity performance of receivers and the relevant guidelines for specific types of radio operation, *i.e.*, how would consumers know about receiver performance in order to make informed decisions?

21. We also seek comment on the relationship between the appropriateness of receiver standards and models used to manage the spectrum.[21] Limiting transmitter in-band power and spill-over into adjacent bands and areas, together with the definition of assigned frequency bands and areas, provide substantial definition to the interference environment in which licensees must design their systems. Given these rules, would the costs and benefits of improved receiver interference performance be internal to licensees, and would they thus make efficient decisions regarding receiver performance? Would there be a need for receiver standards under a fully implemented property rights model, where markets allocate exhaustively and exclusively defined spectrum usage rights? How would such rules affect licensees, such as broadcasters, who do not have a decisional role in the performance of consumer receivers?

22. We believe that the Commission has the necessary statutory authority to promulgate receiver immunity guidelines and standards under Sections 4(i), 301, 302(a), 303(e), (f), and (r) of the Communications Act of 1934, as amended.[22] We request comment on this assessment of our authority.

C. Use of Receiver Interference Immunity Performance Guidelines and Standards in Specific Radio Services

23. The receiver interference environment and demands placed on receiver performance are, to a large degree, dependent on the specific service supported by the equipment and the services provided on neighboring frequency bands. For example, mobile services that operate on relatively narrow channels with no guard bands or separation between communications channels need to use relatively high quality receivers that are sensitive to low level signals, provide good selectivity, and are resistant to overloading. Similarly, a service which involves safety of life generally needs to use equipment that is more robust in tolerating potentially interfering signals, to provide added assurances of dependable, reliable operation in environments where such signals are present. On the other hand, the signals of the terrestrial broadcast services, such as AM radio, can be received with relatively low cost receivers that may be less sensitive to low level signals, less selective, and more susceptible to overloading. As a result of such differences, we intend to explore operational environments and characteristics of the different types of services as they affect minimum receiver performance needs, as part of our investigation in this proceeding. As observed

[21] The Spectrum Policy Task Force Report identifies three general models for assigning spectrum usage rights: command and control, exclusive use (property-like rights), and spectrum commons or open access. *See* Task Force Report at p. 35.

[22] *See* 47 U.S.C. 154(i), 301, 302a(a), and 303(a), (e), (f), and (r).

by the Task Force, the types of operations and services occupying neighboring frequency bands are a significant factor in the environment in which a receiver operates, and so we seek information on receiver performance issues of specific types of service and operations relating to both the in-band and out-of-band environments.[23]

24. Given the large number of communication services, it appears more tractable to consider grouping the service related receivers immunity performance parameters that would most directly impact the development of receiver metrics. One grouping by service would include: 1) public safety services, 2) satellite services, 3) mobile services, d) fixed terrestrial services, and 5) broadcast services. Another grouping by area of use could consider services functioning in metropolitan and rural areas. Neither grouping is meant to be exclusive, but simply to isolate major performance and environment factors that could be considered for the development of receiver interference immunity performance standards. We seek comment on the types of groupings of services that would simplify the development of robust receiver performance, recognizing that, whenever appropriate, we have granted broad flexibility for licensees to offer different services in the same frequency band in order to respond to ever-changing marketplace needs. With the large number of communications services that are currently in operation, a program to study and define minimum receiver performance specifications across all radio services will be a substantial undertaking. We request comment and suggestions on how to plan for and manage such a program should we decide to undertake it. In particular, we request comment and suggestions regarding the services and/or receiver types with which to begin and how we should organize the process for defining immunity specification. We intend to closely involve industry and other interested parties that have expertise and interest in these matters in the specification process and request comment on how that involvement should be arranged. In this same context, we request comment on the parties that should be included in the work on developing standards for receivers use in the various services and/or service groupings. As discussed above, the specification of minimum receiver interference immunity performance guidelines/standards will involve tradeoffs in costs and perhaps other factors. We therefore ask for information on the cost implications of the various options for minimum immunity specifications for receivers used with the various radio services. We seek comment on issues relating to receiver immunity performance and guidelines/standards in our suggested service groupings as discussed below. We also seek comment on whether these groupings are appropriate, or whether grouping by other factors such as frequency band or operating bandwidth are more appropriate.

25. *Public safety services* – Public safety communications systems are used by organizations such as police, fire and emergency medical services whose mission often involves safety of life. These organizations need and, indeed, demand that their communications systems provide a very high degree of reliability. Thus, the operating requirements of public safety communications systems would seem to warrant or even necessitate the use of receiver immunity performance guidelines/standards that are tighter than those for general communication services. This could be affected perhaps by requiring that the guidelines/standards for public safety receivers be set higher than those for other equipment. We ask the following questions in this regard:

- Should we adopt an approach that would subject public safety communications systems to higher requirements for receiver interference immunity performance than other classes of receivers?

- What parameters of public safety system performance should be subject to minimum guidelines/standards for immunity to interference and how should we establish such guidelines/standards?

[23] The *Task Force Report* recommended that the Commission consider making spectrum decisions that would encourage like systems or devices to be grouped in spectrum "neighborhoods." *Task Force Report*, at p 22.

- What values should be specified for the parameters of public safety receiver interference performance?

- Are the reliability needs of public safety systems used for different types of operation, such as dispatch, personal location/identification, video/audio monitoring, telemetry, etc. different and if so, how should these differences be treated in establishing minimum performance guideline/standards?

- In cases where a general communication service can be used in a safety of life or property mode (such as E911 and VHF marine), should receivers used with such services be subject to guidelines/standards for interference immunity similar to those for public safety of receivers when operating in a safety mode?

26. As an illustration of a current approach on receiver standards for public safety services, the Public Safety National Coordination Committee (hereinafter the "NCC") has identified technical standards for radio receivers operating on the interoperability channels in the 700 MHz public safety band.[24] It has also proposed that these standards be incorporated into the equipment certification requirements of Part 90, Subpart R of our rules, 47 C.F.R. 90, Subpart R.[25] In developing these proposals, the NCC considered recommending a metropolitan statistical area interference environment and a less stringent rural service area interference environment.[26] However, it concluded that all of the receivers operating on the interoperability channels of the newly allocated 700 MHz public safety band should meet the metropolitan environment standard partly because of their public safety nature, and partly because of the inherent difficulty of enforcing a rule that specifies that certain radios can be used only in certain geographic areas. The NCC also decided not to specify receiver standards for radios operating on the non-interoperability channels in the 700 MHz public safety band since the technologies to be used in that portion of the band are not fully known. It deferred to the marketplace on that issue. We request comment on the possible use of similar approaches, including the reliance on a national committee process for development of receiver immunity standards for other public safety bands.

27. *Satellite services* – Satellite receivers must be very sensitive to low level received signals and therefore can be adversely affected by communications systems in adjacent bands. They can also experience interference from low level ambient noise sources that are below the minimum sensitivity level of receivers used in other types of radio services. Satellite communications systems are currently used for radionavigation, mobile communications, broadcast video and audio services, and fixed services. Each of these types of service has its own operating considerations and some are much more robust with respect to interfering signals than others. For example, fixed satellite systems that operate with geo-stationary orbit (GSO) satellites may use high gain antennas that provide high levels of signal, thus mitigating the relatively low level of the received signal. Fixed receivers used with direct broadcast satellite services also use dish antennas that provide considerable gain. However, mobile satellite

[24] Letter of April 15, 2002, from the NCC to the Chief, FCC Wireless Telecommunications Bureau, subject: NCC Recommendations for Receiver Standards. In the *First Report and Order* in WT Docket No. 96-98, the Commission determined that formation of a national committee to advise it on the optimum use of interoperability in the 700 MHz public safety bands was the best mechanism for implementing nationwide seamless interoperability on those frequencies. *See First Report and Order* in WT Docket No. 96-98, 14 FCC Rcd 152 (1999), at ¶¶ 92, 116, 121. The Commission therefore chartered the NCC pursuant to the federal Advisory Committee Act effective February 25, 1999. The interoperability channels are specified in Section 90.531 of the rules, 47 C.F.R. 90.531.

[25] 47 C.F.R. 90, Subpart R.

[26] April 15, 2002 NCC letter at 1. Consideration was given to adopting both the "A" (Metropolitan Statistical Area interference environment) and the less stringent "B" (Rural Service Area interference environment) standards in order to give rural users the option of buying presumably less expensive "B" standard receivers. However, the NCC concluded that requiring all receivers to meet the "A" standard was the better course because, particularly in large scale urban emergency incidents, it may necessary to enlist the aid of public safety organizations from rural areas.

receivers and mobile satellite radionavigation receivers use antennas that provide relatively low gain and thus must have very high levels of sensitivity to provide service. In the fixed satellite services, the use of high gain directional antennas provides a form of increased system selectivity because potentially interfering sources not located in the main beam of the antenna are attenuated. We seek information on a number of issues concerning interference immunity guidelines/standards for satellite services, as follows.

- How should satellite receiver interference immunity performance guidelines/standards provide protection against interference to low received signal levels?

- In the fixed satellite services, should antenna directionality be considered integral to any receiver interference immunity performance guidelines/standards?

- What parameters of satellite receiver performance should be subject to minimum guidelines/standards for immunity to interference and how should we establish such guidelines/standards?

- What values should be specified for the parameters of satellite receiver interference immunity performance?

- To what extent are the reliability needs of the various types of satellite services different and how should these differences be treated in establishing minimum performance guideline/standards? In addition are there any differences in specifications that are needed due to differences between fixed and mobile satellite services, and are different specifications needed for receivers used with low-Earth orbit (LEO) satellite systems than for receivers needed for GSO systems?

28. *Mobile services* – Mobile radio services include a broad range of systems operating on the land, the seas, and in the air. Specific services range from the mobile systems of the Commercial Mobile Radio Services, to business radios and "push to talk" operations, to maritime safety and communications systems, and to aviation communications systems for commercial and private air traffic. While these systems vary in their sophistication and operating ranges, all mobile receivers typically experience varying signal levels throughout their service area. For example, where a mobile unit is close to its base station, both the mobile and base station can operate with signal levels high enough to support operation. At the other extreme, when a mobile unit is operating near the edge of its operating range, both the mobile unit and its base station will receive relatively weaker signals. Mobile receivers also face operating complications such as reflected signals, or "multipath," and varying levels of undesired and potentially interfering signals that vary depending on their location and operating frequency. In addition to these operating challenges, mobile handsets designers must place a large premium on light weight and small size. Thus, mobile systems, and handset units in particular, constitute one of the most demanding challenges in minimizing interference.

29. We believe it is appropriate to examine mobile receiver immunity performance in the light of our changing spectrum management policies, and particularly to determine whether the operation of these devices and spectrum efficiency could be enhanced by development of minimum receiver performance specifications. We request comment on the need for mobile radio immunity guidelines/standards and responses to the following questions on this issue:

- What minimum interference immunity performance would be appropriate for mobile service receivers and how those minimums compare to the performance of existing mobile service receivers?

- Should mobile receivers be subjected to more stringent minimum performance requirements than receivers for other communications services, given the higher variation in operating environment conditions experience in the course of mobile operation? Would the

specifications established under such an approach have an impact on the practical requirements of mobile equipment for small size and light weight?

- To what extent are the reliability needs of the various types of mobile radio services different and how should these differences be treated in establishing minimum performance guidelines/standards?

30. *Fixed terrestrial services* – Fixed terrestrial services include point-to-point and point-to-multipoint facilities. Point-to-point operations usually use highly directional transmit and receive antennas in order to minimize the potential for receiving interference and causing interference to others. Such operations are typically used for private or common carrier communications links, often as part of a bi-directional system with a transmitter and receiver at each end of the link. Point-to-multipoint operations sometimes use sectorized antennas that transmit in a broadcast-like mode to receivers used at fixed locations. The fixed receivers use highly directional antennas that are pointed at the transmitting antenna. Point-to-multipoint operations are generally used for one-way distribution of communications, including, for example, data and video programming, but two-way voice and data operation are also being developed and used. Fixed services are generally exposed to a constant fixed interference environment characterized by the location of specific operations. We request comment on the need for interference immunity guidelines/standards for fixed terrestrial receivers in light of our changing approach to spectrum management, particularly with regard to licensing of frequencies on a geographic basis. We seek comment and information on the following questions concerning minimum interference immunity guidelines/standards for fixed terrestrial facilities:

- We recognize that in many cases, fixed terrestrial facilities, particularly those used for point-to-point operations, are designed for high reliability. Do existing design features for ensuring high reliability include measures for immunity to interference?

- We also recognize that certain terrestrial point-to-point and point-to-multipoint receivers are designed to accommodate a wide bandwidth (*e.g.* Cable Television Relay Stations that deliver 80 video channels or more.) The receivers of such systems, by design, have little interference immunity. Should immunity guidelines/standards apply to such receivers?

- Should fixed terrestrial receivers be subjected to less stringent minimum interference immunity performance requirements than receivers used with other types of services, given the lesser variation in operating environment conditions generally experienced in the course of fixed operation?

- If minimum interference immunity performance guidelines/standards would be appropriate for fixed terrestrial service receivers, what minimum parameter values should be specified and how would those minimums compare to the performance of existing equipment used with these services?

31. *Broadcast services* – The broadcast AM, FM, and television services operate much like fixed point-to-multipoint services, in that many consumer radios and television sets receive one-way communications from one or more fixed transmitter sites. However, the technical quality of service provided by different models of radio and television receivers varies to some extent, depending on the design of the device. These variations generally reflect manufacturers' perceptions of user demand balanced against cost/pricing factors. For example, the research conducted in response to the low power FM radio proceeding indicated that lower cost FM receivers may provide more limited service capabilities.[27] Generally, allowing manufacturers to determine the performance capabilities of broadcast

[27] *See Report and Order* in MM Docket No. 99-25, 15 FCC Rcd 2205 (2000), at ¶ 98.

receivers, including the performance of their tuning/signal acquisition sections, historically has yielded product models that provide satisfactory service for consumers at attractive price levels.

32. Recognizing the above factors, we request comment on the desirability of developing minimum interference immunity performance specifications for broadcast receivers. In considering minimum immunity specifications for broadcast receivers, it is not our intent to reverse our longstanding practice of allowing the market to determine the performance of broadcast receivers, with the Commission stepping in only where obvious deficiencies appear that could disrupt the general reception of service.[28] Rather, we believe that guidelines, applied on a voluntary basis, could perhaps lead to the marketing of product models with high interference immunity that consumers could purchase to meet their performance needs. Such models might be particularly desirable for consumers to receive quality services.

33. Recently, the Commission selected in-band-on-channel (IBOC) as the technological approach for terrestrial digital audio broadcasting and permitted AM and FM radio broadcasters to commence digital operations on an interim basis using the hybrid IBOC systems developed by iBiquity Digital Corporation.[29] It is expected that hybrid analog and digital audio broadcasting will continue for at least a decade. In light of this, we ask the following questions about AM and FM receivers:

- What minimum interference immunity parameters should be established for analog and analog/digital (hybrid) AM and FM receivers?

- What would be the additional costs to consumers of radio receivers that would provide interference immunity based on such established guidelines?

- What protection, if any, should be afforded the millions of analog radio receivers now in use and available for sale?

- How should consumers be informed of differences in radio receiver immunity performance? Would a recognizable label or symbol on a receiver assist consumers in identifying equipment with improved performance?

34. We request comment on the following questions relating to the development and implementation of minimum interference immunity guidelines for broadcast television receivers:

- What minimum interference immunity parameter values should be specified for DTV broadcast receivers and how would those minimums compare to the performance of existing equipment used in this service?[30]

- What would be the additional costs to consumers of DTV receivers that would provide interference immunity as specified in established guidelines?

- How should consumers be informed of differences in broadcast receiver interference immunity performance?

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[28] For example, in the first review proceeding on the DTV transition, the Commission intervened to promote improvements in the ability of DTV receivers to handle multipath signals. *See Report and Order and Further Notice of Proposed Rulemaking* in MM Docket No. 00-39, 16 FCC Rcd 5946, at ¶ 88-92.

[29] *See First Report and Order* in MM Docket No. 99-325, FCC 02-286, October 10, 2002.

[30] We would assume that since analog TV service is being replaced by DTV service, no guidelines would be specified for analog-only TV receivers; i.e., receivers without digital broadcast tuners.

35. We also ask for comment on an approach that would provide a fast-track for the development and implementation of voluntary receiver performance standards for broadcast DTV receivers. Television broadcast industry representatives, including the National Association of Broadcasters (NAB), the Association for Maximum Service Television (MSTV), and Sinclair Broadcast Group, Inc. (Sinclair), have requested that we impose minimum performance thresholds on DTV receivers with respect to receiver sensitivity (noise figure and carrier-to-noise ratio), selectivity (co-channel and adjacent channel desired-to-undesired signal ratios), dynamic range, and multipath tolerance (adaptive equalizer performance).[31] While we have denied these requests in the context of mandatory performance standards, and are herein dismissing a Petition for Reconsideration in this regard from Sinclair,[32] we do believe that it is important that we continue to encourage manufacturers to provide adequate tuning capability for broadcast DTV signals, to monitor the performance of DTV receivers as they are introduced to the market, and to intervene if performance is found lacking in specific areas. We also believe that DTV receiver specifications may be useful in this effort as voluntary standards.

36. In this regard, we believe there could be benefit to an approach that would encourage the development of minimum performance guidelines for DTV receivers and enable manufacturers to market a special category of receivers that meet such guidelines. Under the approach we are suggesting, industry parties representing broadcasters, consumer electronics manufacturers, consumers, and others as appropriate, would identify the relevant DTV receiver performance parameters, develop appropriate minimum performance specifications for those parameters, and publish them. Receivers that meet these specifications could then be clearly marked with a recognizable label or symbol to identify them as complying with industry accepted standards for quality reception. Such identification would allow consumers to easily identify high performance products and manufacturers/ retailers to emphasize the features of those products to encourage consumers to purchase them. As part of this approach, the Commission could include reference to the minimum performance standards in its rules and provide that only models that comply with these voluntary standards could be marketed as complying with the industry standards for performance quality or other terminology as might be defined through our rule making process. We request comment on this approach and suggestions for alternative approaches that would provide for implementation of minimum performance specifications for DTV receivers on a voluntary basis. We also request comment on the timeframes that would be required for an industry group to develop recommendations for improved receiver performance. We recognize that digital broadcast tuners will soon become mandatory in many television receivers and the corresponding need to move expeditiously if these standards are to be available in a timely fashion. We request comment on whether an industry group tasked with developing receiver guidelines could be convened within a three month period, and whether recommendations could be developed within six to nine months after that. We

[31] *See Petition for Reconsideration* filed by NAB, MSTV, and the Association for Local Television Stations (ALTV) on March 15, 2001 in MM Docket 00-39 and *Petition for Reconsideration* filed on November 25, 2002 in MM Docket 00-39.

[32] Sinclair submitted a Petition for Reconsideration of our decision in the *Second Report and Order and Second Memorandum Opinion and Order* ("*Second Report and Order*") in MM Docket No. 00-39, *Review of the Commission's Rules and Policies Affecting the conversion to Digital Television*, 17 FCC Rcd 15978 (2002), asking that we clarify our decision to require that new television receivers include DTV tuning capability by adopting requirements to ensure that all DTV receivers are capable of adequately receiving DTV signals. Specifically, it asks that we adopt requirements for a receiver noise figure, dynamic range, sensitivity, selectivity, and multipath handling. In the *Second Report and Order*, at ¶¶ 60-67, we denied a request by MSTV, NAB, and the Association of Local Television Stations (ALTV) that we establish minimum performance thresholds for these same aspects of DTV receiver performance. In that decision, we reiterated our earlier denials of requests from broadcasters to standardize these elements of DTV receiver performance in the *Report and Order and Further Notice of Proposed Rule Making* in MM Docket No. 00-39, 16 FCC Rcd 5946 (2000) and the *Memorandum Opinion and Order on Reconsideration of the Sixth Report and Order* in MM Docket No. 87-268, 13 FCC Rcd 7418 (1998). We therefore are dismissing Sinclair's Petition for Reconsideration on the grounds that it is repetitive, pursuant to Section 1.429(i) of the rules, 47 C.F.R. 1.429(i).

will also continue to encourage the inclusion of adequate reception quality in DTV receivers and to monitor the performance of DTV receivers in this regard through efforts to be conducted by our DTV Task Force, Media Bureau, and Office of Engineering and Technology.

D. The Impact of Minimum Performance Specifications for Receiver Immunity on Innovation and the Marketplace

37. Receiver interference immunity performance specifications have the potential to impact receiver markets in various ways depending on how they are implemented. At the mildest level of impact, any performance specifications may create product differentiation that is generally desirable for consumers/users. For example, voluntary industry guidelines that imply, or define, that compliant products are better or more desirable than those that are not compliant would create product differentiation. At the same time, the cost of producing compliant devices might be higher than the cost of producing non-compliant devices, resulting in higher prices for compliant products. Consumers/users would ultimately determine whether the compliant products are successful, based on whether they would be willing to pay any higher prices that might be charged for the enhanced performance of those products. At the highest level of impact, mandatory standards with which all products must comply could be expected to result in better, presumably more desirable, products that again might cost more to produce. However, mandatory standards could also stifle innovation by restricting the introduction of products with otherwise desirable new features that are inconsistent with the standards. The time and expense associated with changing mandatory standards can also tend to stifle innovation. The purchasers of products subject to mandatory standards would decide whether the devices succeed or fail in the market. For example, if prices were too high or other features were adversely affected, consumers/users might shift to an alternative communications service. We request comment on the impacts of receiver immunity performance specifications on innovation and markets for receiver equipment. Commenting parties are specifically asked to respond to the following questions:

- What effects would interference immunity performance specifications, in the form of either voluntary guidelines or mandatory standards, have on innovation in equipment design, performance (especially with regard to performance not addressed by specifications) and features?

- What effects would such specifications, again in the form of either voluntary guidelines or mandatory standards, have on receiver markets in terms of cost of production, price and availability of equipment, and user demand?

- What aspects of specifications would have the greatest impacts on innovation and markets and what steps could be taken to minimize or mitigate their impacts.

- To what extent should assessments of the impact on innovation and markets be a factor in the processes that define guidelines and standards?

E. The Current Receiver Environment

38. The current population of radio receivers generally is subject only to rules limiting the amount of unintentional emissions they may radiate.[33] Thus, existing receivers are, for the most part,

[33] Radio receivers generate and use energy at RF frequencies. If not designed properly, a receiver can unintentionally radiate a portion of this energy and/or conduct it onto the AC power line to which the unit is connected and thereby be a source of interference itself. The rules limiting such unintentional emissions from RF devices, including receivers, are set forth in our rules at Section 15.107 (power line conducted emissions), 47 C.F.R. § 15.107 and Section 15.109 (radiated emissions), 47 C.F.R. § 15.109. Certain receivers, such as broadcast television receivers and "cable ready"/"cable compatible" receivers are also subject to minimum performance requirements for internally generated noise ("noise figure") and sensitivity, and in the case of "cable ready"/"cable

(continued....)

built to provide levels of interference immunity as determined necessary by their designer/manufacturer to provide satisfactory service. This has, of course, resulted in a wide range of immunity performance across products used within the same services and across services. We seek to develop information describing the interference immunity characteristics of receivers used in the various radio services. We ask for comment and information in response to these specific questions:

- How do existing receivers used with the various radio services perform with regard to each of the immunity attributes discussed above?
- How many units with these capabilities are currently in service?
- What is the expected remaining service life of existing receivers?

F. Treatment of Existing Receivers

39. There are literally billions of receivers currently in use with the various radio services. Depending on the extent to which new receiver interference immunity performance guidelines/standards might become central to particular spectrum policies, these existing receivers could pose impacts to our new spectrum management policies ranging from none to significant. There are a range of possible approaches that could be adopted for treatment of existing receivers, and the appropriate approach to apply would depend on a variety of circumstances. For example, if we were to adopt the guidelines approach for quality DTV receivers discussed above and did not change pertinent channel allotment or other technical criteria, existing DTV receivers and new units of these same or similarly performing models would pose no impact on our spectrum policies. On the other hand, if we were to find it necessary to reclaim a portion of the spectrum used by a service, as we have done in the case of the broadcast auxiliary service at 1990-2110 MHz, and needed to support the same number of operations in the remaining spectrum, it might be necessary to require or provide incentives to users to switch to a new technology or more efficient receiver design that complies with minimum interference guidelines/standards and to cease using existing equipment.[34]

40. Looking at this subject more generically, we observe that in situations where we adopted spectrum policies that assumed receivers performed in accordance with a given set of interference immunity specifications, it is likely that many of the existing receivers could continue to provide satisfactory service. That is, the interference conditions that would necessitate the use of receivers meeting the applicable guidelines/standards would not be present everywhere, and in locations where potentially interfering signals were not present or were present at levels within the capabilities of existing receivers, those units could provide satisfactory service. Accordingly, one approach would be to simply allow users to change to new receivers as they encountered interference. Of course, where the service would be of more critical importance, it might be necessary to require replacement of receivers, and "middle ground" approaches that provided for a transition to mandatory use of new receivers are possible also. We request comment and suggestions on the matter of how to treat existing receivers that do not comply with any new receiver minimum interference immunity specifications that may be developed, and how the size of the installed receiver base should affect the development of receiver interference

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compatible" receivers, adjacent channel, image channel, direct pickup, and tuner overload performance. *See* Sections 15.117 and 15.118 of the rules, 47 C.F.R. §§ 15.117 and 15.118. Television receivers with screen sizes 13" and larger are also subject to requirements that they include features for displaying closed caption information and blocking programs in accordance with program ratings information transmitted by broadcaster television stations and other video media providers.

[34] *See Memorandum Opinion and Order and Third Notice of Proposed Rule Making* in ET Docket No. 95-18, *Amendment of Section 2.106 of the Commission's Rules to Allocate Spectrum at 2 GHz for Use by the Mobile Satellite Service*, 13 FCC Rcd 23949 (1998).

immunity performance guidelines/standards. We specifically ask that interested parties address the criteria that we should use in making determinations to take actions that would involve the involuntary replacement of receivers, either on a rapid or transitional basis, for example, in the case of public safety, other services involving safety-of-life or property, or services involving security of the public or national security. In the event such an action were determined to be necessary, what would be an appropriate phase-in time period?

III. PROCEDURAL MATTERS

41. This is an exempt notice and comment rule making proceeding. *Ex parte* presentations are permitted, except during any Sunshine Agenda period. *See generally* 47 C.F.R. §§ 1.1200(a), 1.1203, and 1.1204(b).

42. Pursuant to Sections 1.415 and 1.419 of the Commission's rules, 47 C.F.R. §§ 1.415, 1.419, interested parties may file comments on before **75 days after publication in the Federal Register**, and reply comments on or before **105 days after publication in the Federal Register**. Comments may be filed using the Commission's Electronic Comment Filing System (ECFS) or by filing paper copies. *See Electronic Filing of Documents in Rulemaking Proceedings*, 63 Fed. Reg. 24,121 (1998).

43. Comments filed through the ECFS can be sent as an electronic file via the Internet at <http://www.fcc.gov/e-file/ecfs.html>. Generally, only one copy of an electronic submission must be filed. If multiple docket or rulemaking numbers appear in the caption of this proceeding, however, commenters must transmit one electronic copy of the comments to each docket or rulemaking number referenced in the caption. In completing the transmittal screen, commenters should include their full name, Postal Service mailing address, and the applicable docket or rulemaking number. Parties may also submit an electronic comment by Internet e-mail. To get filing instructions for e-mail comments, commenters should send an e-mail to ecfs@fcc.gov, and should include the following words in the body of the message, "get form <your e-mail address>." A sample form and directions will be sent in reply.

44. Parties who choose to file by paper must file an original and four copies of each filing. If more than one docket or rulemaking number appears in the caption of this proceeding, commenters must submit two additional copies for each additional docket or rulemaking number. All filings must be sent to the Commission's Secretary, Marlene H. Dortch, Office of the Secretary, Federal Communications Commission, The Portals, 445 Twelfth Street, S.W., Washington, D.C. 20554.

45. Parties who choose to file by paper should also submit their comments on diskette. These diskettes should be submitted to: Hugh L. Van Tuyl, Office of Engineering and Technology, Federal Communications Commission, The Portals, 445 Twelfth Street, S.W., Room 7-A133, Washington, D.C. 20554. Such a submission should be on a 3.5 inch diskette formatted in an IBM compatible format using Word for Windows or compatible software. The diskette should be accompanied by a cover letter and should be submitted in "read only" mode. The diskette should be clearly labeled with the commenter's name, proceeding (including the lead docket number, in this case ET Docket No. 00-47, type of pleading (comment or reply comment), date of submission, and the name of the electronic file on the diskette. The label should also include the following phrase "Disk Copy - Not an Original." Each diskette should contain only one party's pleadings, preferably in a single electronic file. In addition, commenters must send diskette copies to the Commission's copy contractor, International Transcription Service, Inc., 1231 20th Street, N.W., Washington, D.C. 20037.

46. Comments and reply comments will be available for public inspection during regular business hours in the Reference Information Center (Room CY-A257) of the Federal Communications Commission, The Portals, 445 Twelfth Street, S.W., Washington, D.C. 20554. Copies of comments and reply comments are available through the Commission's duplicating contractor:

47. To request materials in accessible formats for people with disabilities (Braille, large print, electronic files, audio format), send an e-mail to fcc504@fcc.gov or call the Consumer & Governmental Affairs Bureau at 202-418-0531 (voice), 202-418-7365 (TTY)."

48. To make cited sources more easily available to the readers, we are testing the use of hyperlinks to some FCC documents that are cited in this document. The World Wide Web addresses/URLs that we give here were correct at the time this document was prepared but may change over time. We also advise that the only definitive text of FCC documents is the one that is published in the FCC Record. In case of discrepancy between the electronic documents cited here and the FCC Record, the version in the FCC Record is definitive.

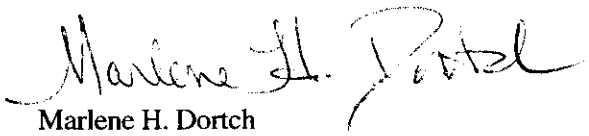
IV. ORDERING CLAUSES

49. Accordingly, IT IS ORDERED that, pursuant to Sections 4(i), 301, 302, 303(e), 303(f), 303(r) and 307 of the Communications Act of 1934, as amended, 47 U.S.C. Sections 154(i), 301, 302, 303(e), 303(f), 303(r) and 307, this Notice of Inquiry IS HEREBY ADOPTED.

50. IT IS FURTHER ORDERED that, pursuant to Section 1.429(i) of the Commission's rules, 47 C.F.R. 1.429(i), the Petition for Reconsideration of the *Second Report and Order and Second Memorandum Opinion and Order* in MM Docket No. 00-39 submitted by Sinclair Broadcast Group, Inc. IS DISMISSED as repetitive for the reasons indicated herein.

51. For further information regarding this Notice of Inquiry, contact Mr. Hugh L. Van Tuyl, Office of Engineering and Technology, (202) 418-7506, e-mail hvantuyl@fcc.gov.

FEDERAL COMMUNICATIONS COMMISSION



Marlene H. Dortch
Secretary

SEPARATE STATEMENT OF CHAIRMAN MICHAEL K. POWELL

Re: Interference Immunity Performance Specifications for Radio Receivers; ET Docket No. 03-65.

The Spectrum Task Force has offered a number of proposals for refining the FCC's approach to interference and developing better metrics for describing and quantifying the interference environment in particular bands. The development of receiver standards is an integral part of this effort. Spectrum is too critical a resource in our digital economy to allow interference avoidance to be addressed on an ad hoc incremental basis. All factors that contribute to the interference environment and, ultimately, the ability of users to receive clear radio signals, must be taken into account as early in the process as possible.

Technological advancements in the ability to reject unwanted signals and the filtering capacity of radio receivers present the Commission with an opportunity. In a world where spectrum sharing is increasingly necessary and common, more selective receivers reduce the need for the Commission to become mired in paralyzing interference debates pitting incumbents against new entrants. Instead, shared expectations about the characteristics of receiver equipment allow all parties to plan for and mitigate interference.

As we initiate this proceeding, our objective is to gather information on the technological landscape – what is the state-of-the-art in receiver technology and what is deployed in the field. Without baselines, there can be no benchmarks. In developing these baselines, I prefer to rely on market incentives and voluntary industry programs to establish receiver immunity guidelines in the first instance. Such guidelines will promote more efficient use of the radio spectrum, increasing opportunities for innovation and the delivery of new services to the American public.

SEPARATE STATEMENT OF COMMISSIONER KATHLEEN Q. ABERNATHY

Re: Interference Immunity Performance Specifications For Radio Receivers (ET Docket No. 03-65); Review of the Commission's Rules and Policies Affecting the Conversion to Digital Television (MM Docket No. 00-39), Notice of Inquiry

Today's NOI is an important step toward improving the Commission's spectrum management policy. As part of its approach, the FCC traditionally has relied primarily on approaches that control the emissions and locations of transmitters and the frequencies used by specific types of radio operations. While this method has worked in the past, the changing pace of technology and the increasing demands placed on the spectrum resource indicate that it is time for the FCC to look into changing its approach. Accordingly, and as recognized in the Spectrum Task Force Report, I believe that this NOI moves the FCC in the right direction by promoting a more flexible and market-oriented approach to setting interference immunity performance standards for radio receivers.

Today's NOI sets the stage for the FCC to gather data from all interested parties on ways to ensure flexibility to allow for the introduction of new digital radio technologies and to allow licensees the flexibility to implement new technologies in receiver standards. Importantly, the NOI proposes to accomplish this through the imposition of both voluntary guidelines and, where appropriate, mandatory rules. This approach is consistent with my view on spectrum management that where possible, the FCC should afford licensees flexibility in the deployment of technologies.

At the end of the day, this proceeding will have a direct impact on the every day life of American consumers. For example, the information gathered in this proceeding will form the basis for the interference standards for many of the items we each use on a daily basis including the next generation of digital televisions and AM/FM radios. I look forward to gathering a record in this proceeding that will help us harness the enormous potential of spectrum-based services to bring to consumers innovative technologies and new services.

SEPARATE STATEMENT OF COMMISSIONER MICHAEL J. COPPS

RE: 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

This NOI is important and forward looking. I commend the Chairman and OET for beginning the process of systematically exploring how the Commission can further our statutory responsibility to increase the efficiency and intensity of use of the spectrum through receiver standards. The Commission usually focuses on transmitters in interference disputes. This, potentially, is a mistake. We must understand whether there are actions that industry and the Commission can take to ensure that unreasonably fragile receivers do not undermine the efficient use of our spectrum resource. But we must also understand the costs of designing more robust receivers. This NOI will begin that process, and I look forward to receiving a full record.

SEPARATE STATEMENT OF COMMISSIONER KEVIN J. MARTIN

Re: *Interference Immunity Performance Specifications for Radio Receivers, Review of the Commission's Rules and Policies Affecting the Conversion to Digital Television, Notice of Inquiry, ET Docket No. 03-65, MM Docket No. 00-39*

I am pleased to support this Notice of Inquiry (NOI), which explores standards for receivers' immunity from interference. The Commission has traditionally approached issues of interference by focusing solely on transmitters, regulating their emissions and locations. However, the experience of interference is a function of the interaction between both transmitters and receivers. The Commission's Spectrum Task Force thus recommended that the Commission consider applying performance requirements to receivers. This NOI builds on the recommendations of the Task Force and seeks input on whether and how the Commission could promote receiver standards, either through incentives, voluntary industry actions, regulatory mandates, or some combination of these approaches. The use of receiver standards – when coupled with guidelines for transmitters – could dramatically reduce the potential for harmful interference. This would allow for greater sharing of spectrum, which is critical to address the growing demands on what is currently a finite resource. Indeed, had receiver standards been in place in the past, we might not face many of the interference problems we do today. I thus welcome the commencement of this inquiry and look forward to reviewing the comments in this proceeding.

SEPARATE STATEMENT OF COMMISSIONER JONATHAN S. ADELSTEIN

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

I believe that our proceeding on receiver performance standards will turn out to be one of the most significant spectrum management proceedings that the Commission initiates in the near future. The members of the Spectrum Policy Task Force should be commended for highlighting this issue in their recent report.

I have said in the past that, when it comes to spectrum management, we need to do "more with less." Spectrum is a finite resource, and our goal as policymakers is to make the spectrum stretch farther and farther so that it can accommodate more and more users as well as the newest service offerings. Innovation swirls all around us, and as regulators we need to make sure that we always consider the latest technologies in developing policy, especially in considering spectrum policy. When an engineering opportunity comes to light, such as receiver performance standards, it is our obligation to fully investigate its possibilities.

I fully support this inquiry into receiver performance standards because it takes an important first step towards improving our country's access to spectrum. This in turn should provide for improved radio communications services to the public. When it comes to spectrum, doing more with less is essential because the wireless industry thrives on innovation and engineering. These characteristics regularly lead to advances in capacity and service offerings - demonstrating that you sometimes truly can do more with less.