

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C.**

In the Matter of

Interference Immunity Performance Specifications
for Radio Receivers

ET Docket No. 03-65

COMMENTS OF MICROSOFT CORPORATION

Paula H. Boyd
Marc Berejka
MICROSOFT CORPORATION
1401 Eye Street, N.W., Suite 500
Washington, D.C. 20005
(202) 263-5946

Scott Blake Harris
Mark A. Grannis
HARRIS, WILTSHIRE & GRANNIS LLP
1200 Eighteenth Street, NW
Washington, D.C. 20036
(202) 730-1300
Counsel to Microsoft Corporation

Mark A. Sturza
3C SYSTEMS COMPANY
16161 Ventura Blvd., Suite 815
Encino, California 91436
Consultant to Microsoft Corporation

21 July 2003

SUMMARY

Microsoft welcomes the Commission's Notice of Inquiry regarding Interference Immunity Performance Specifications for Radio Receivers. A receiver's "interference immunity" is a dimension of spectrum use that can and should be subject to regulatory influence, just as transmitter power, bandwidth, geography, and time can be regulated to facilitate more intensive use of the spectrum. Indeed, the Commission has required at least some receivers to exhibit a certain degree of interference immunity for years, explicitly in some cases and implicitly in others. Accordingly, the idea of specifying some level of receiver performance is far from radical, and the Commission should move forward from this Inquiry quickly to begin capturing important benefits in spectrum efficiency and spectrum access for the public.

In these Comments, Microsoft first urges the Commission to define interference immunity specifications more explicitly and more comprehensively across the radio spectrum. Greater use of such specifications will not only improve spectrum efficiency for existing users; it will also make a major contribution toward increased spectrum access by defining the extent of the exclusivity that licensees do and do not enjoy and thereby clearing the way for greater use of licensed and unlicensed underlay services.

Second, Microsoft urges the Commission to specify the desired levels of interference immunity at the highest level of generality that can reasonably be applied in any given band. In bands where new allocations and service rules are adopted after this Inquiry, the specification of "interference temperatures" appears at this time to be the best way to increase spectrum access without unduly constraining the freedom of licensees and manufacturers to innovate. In bands

where an “interference temperature” approach is more problematic, it may be prudent to regulate specific receiver parameters somewhat more directly.

Third, Microsoft believes that interference immunity specifications, if properly crafted, can be virtually self-enforcing (or more aptly, can be enforced by commercial markets), because the penalty for using inferior receivers need only be that users may experience interference from which they will not be protected. This approach should be effective regardless of whether the Commission bases its receiver specification on interference temperature or on one or more particular receiver parameters.

Finally, although the various specifications adopted by the Commission may eventually converge, or coalesce into a few groups as suggested in the NOI, such an evolution may take many years (if it happens at all), and the Commission should certainly move forward now with respect to individual services, rather than delaying action for the years it might take to develop more general approaches that could cover multiple services.

TABLE OF CONTENTS

	<u>Page</u>
SUMMARY.....	i
TABLE OF CONTENTS.....	iii
I. THE COMMISSION CAN AND SHOULD ACT TO DEFINE EXPLICIT INTERFERENCE IMMUNITY SPECIFICATIONS.	4
II. THE COMMISSION SHOULD PREFER INTERFERENCE IMMUNITY SPECIFICATIONS BASED ON INTERFERENCE TEMPERATURE OR ANOTHER EQUALLY GENERAL PERFORMANCE METRIC	9
III. THE COMMISSION CAN MAKE ITS IMMUNITY SPECIFICATIONS SELF-ENFORCING BY LINKING THEM TO INTERFERENCE PROTECTION.	13
IV. THE COMMISSION SHOULD MOVE QUICKLY TO BEGIN SERVICE-BY-SERVICE DEVELOPMENT OF INTERFERENCE IMMUNITY SPECIFICATIONS.	18
CONCLUSION.....	19

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C.**

In the Matter of

Interference Immunity Performance Specifications
for Radio Receivers

ET Docket No. 03-65

COMMENTS OF MICROSOFT CORPORATION

Microsoft welcomes the Commission’s Notice of Inquiry regarding Interference Immunity Performance Specifications for Radio Receivers.¹ The development of such specifications is an important step toward improving access to spectrum in the United States and toward developing spectrum management policies suited to 21st century technology.² Moreover, Microsoft believes that the development of interference immunity specifications is one of the keys to making additional spectrum available for new unlicensed uses while still protecting incumbents. Although there are significant regulatory and technical challenges to broadly implementing meaningful specifications for incumbent services, the Commission should move forward on that challenge

¹ *Interference Immunity Performance Specifications for Radio Receivers*, Notice of Inquiry, ET Dkt. No. 03-65 (rel. March 24, 2003) (“*NOI*”).

² Microsoft is a worldwide leader in developing software, applications, and Internet technologies. While it is not in the telecommunications business, its software and applications are increasingly designed to run over broadband and wireless “pipes.” Its business depends on bandwidth because its customers depend on bandwidth.

expeditiously, ensuring that such specifications are adopted as soon and as widely as possible, in the manner most appropriate to each band.

Perhaps the greatest strength of the *NOI* is the Commission's recognition that a receiver's "interference immunity" is a dimension of spectrum use that can and should be subject to regulatory influence, just as transmitter power, bandwidth, geography, and time can be regulated to facilitate more intensive use of the spectrum. A regime that guarantees interference-free operation of inferior receivers, even when that prevents others from using the spectrum, is in fact an exclusionary right, which does not differ essentially from the right to exclude other users based on geography or a pre-existing channel assignment. If Commission licensees are to continue to enjoy protection from "harmful interference," then it is in the public interest for the Commission to define the extent of that protection just as explicitly as it defines geographic exclusivity or channel assignments.

By contrast, the chief weakness of the *NOI* is that the Commission seems not to appreciate the full importance of its own key insight. The language of the *NOI* tends to suggest that regulating interference immunity to any degree represents a fundamental paradigm shift in the history of spectrum management, but in fact the Commission already explicitly requires some receivers to exhibit specified levels of immunity. For example, the Commission has long required fixed-satellite earth stations to use antennas capable of distinguishing one satellite's signal from that of another satellite two degrees away.³ Even where receiver performance requirements are not explicit, they can be inferred from emission limitations in adjacent bands, since those

³ 47 C.F.R. § 25.209(f).

limitations are often formulated based on what the receivers of an incumbent service are known or assumed to be able to “live with.”⁴ Conceptually, therefore, the Commission is in fairly familiar territory and should proceed accordingly.

In these Comments, Microsoft first urges the Commission to define interference immunity specifications more explicitly and more comprehensively across the radio spectrum. Greater use of such specifications will not only improve spectrum efficiency for existing users; it will also make a major contribution toward increased spectrum access by defining the extent of the exclusivity that licensees do and do not enjoy and thereby clearing the way for greater use of licensed and unlicensed underlay services.

Second, Microsoft urges the Commission to specify the desired levels of interference immunity at the highest level of generality that is feasible in any given band. In bands where new allocations and service rules are adopted after this Inquiry, the specification of “interference temperatures” appears at this time to be the best way to increase spectrum access without unduly constraining the freedom of licensees and manufacturers to innovate. In bands where an “interference temperature” approach is more problematic, it may be prudent to regulate specific receiver parameters somewhat more directly.

Third, Microsoft believes that interference immunity specifications, if properly crafted, can be virtually self-enforcing (or more aptly, can be enforced by commercial markets), because the penalty for using inferior receivers need only be that users may experience interference from which they will not be protected. This approach should be effective regardless of whether the

⁴ See, e.g., *NOI* ¶ 5 (giving the TV allotment table as an example).

Commission bases its receiver specification on interference temperature or on one or more particular receiver parameters.

Finally, although the various specifications adopted by the Commission may eventually converge, or coalesce into a few groups as suggested in the *NOI*, such an evolution may take many years (if it happens at all), and the Commission should certainly move forward now with respect to individual services, rather than delaying action for the years it might take to develop more general approaches that could cover multiple services.

I. THE COMMISSION CAN AND SHOULD ACT TO DEFINE EXPLICIT INTERFERENCE IMMUNITY SPECIFICATIONS.

The *NOI* sets forth the Commission’s belief “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.”⁵

Microsoft agrees, and urges the Commission to proceed without delay to capture these important public interest benefits.

The adoption of explicit specifications will promote the public interest in at least two distinct and important ways. One of these, of course, is that performance specifications will lead to better receivers; receivers that will make use of current innovations in receiver technology. The effect of better receivers is straightforward and is well described in the *NOI*: *better receivers permit more intensive use of spectrum resources*, making the most of a valuable public asset. Interference immunity specifications cannot totally eliminate interference, either in-band or

⁵ *NOI* ¶ 1.

between bands.⁶ However, they can be used to limit the probability of interference to acceptable levels. If used to facilitate co-frequency sharing between two services, interference immunity specifications can enable the Commission essentially to use the same spectrum twice. Even if this direct improvement in receiver performance were the only benefit of explicit specifications, it would amply justify Commission action.

However, there is a second benefit that perhaps deserves far greater emphasis than it received in the NOI: the *act of specifying* the interference immunity that receivers should achieve makes the bundle of radiofrequency rights represented by an FCC license more determinate. This in itself is an important public interest benefit, independent of what the performance specifications actually are. Dr. Paul Kolodzy explained this point well in his testimony before the Senate Commerce Committee after the release of the *Spectrum Policy Task Force Report*⁷:

[A]ll spectrum users require clear rules governing their interactions with the Commission and other spectrum users. *Regardless of how or to whom particular rights are assigned, ensuring that all rights are clearly delineated is important to avoiding disputes, and provides a clear common framework from which spectrum users can negotiate alternative arrangements.* Currently, spectrum users' rights and obligations are often not defined with sufficient clarity.

⁶ If the separation distance between them is small enough, a continuously emitting transmitter will always interfere with a receiver operating in the same, or an adjacent, band. The laws of physics require that filters have finite width transition bands, and that they have finite out-of-band rejection. In some services, such as satellite (BSS, FSS, MSS) and broadcast (BS), it may be possible to guarantee a minimum separation distance between transmitters and receivers (*e.g.*, orbit altitude for satellite systems and exclusion zones around transmitters for broadcast systems). In these cases, immunity specifications actually can be used to guarantee protection from interference, at least from systems in the same service. For the most part, however, receiver standards can only minimize the probability of interference. For example, it is unlikely that a minimum separation distance can be guaranteed between a mobile transmitter operating in an adjacent band and a fixed receiver. However, if the mobile devices are typically handheld, and the fixed receivers are mounted on roofs or towers, the probability of violating an appropriate minimum separation distance will be small.

⁷ *Spectrum Policy Task Force Report*, ET Dkt. No. 02-135 (Nov. 2002) (“*SPTF Report*”).

An example of this is in defining “harmful” interference, which is one of the primary parameters of the bundle of spectrum rights granted to licensees. But stakeholders in spectrum policy debates can subject the standard of “harm” to multiple subjective opinions and use it to block or delay new services and devices from being introduced into the market. *Given the increasing flexibility in the types of spectrum-based services and, correspondingly, more intensive use of the radio spectrum, the spectrum user and the potential interferer need more certainty about the metrics that determine rights of protection and access.* This is particularly important for incumbent providers who have invested substantial sums in building their networks and providing highly valued services to the public. Therefore, the Task Force concluded that there needs to be, wherever feasible, a more quantitative approach to interference management. *Quantitative standards reflecting real-time spectrum use would provide users with more certainty and, at the same time, would facilitate enforcement.*⁸

As noted above, receiver capabilities of some sort are often assumed, and implicitly required, in existing regulations (such as the TV allotment table or the 2° spacing requirement in the fixed-satellite service). However, precisely because these standards are not explicit, the rules and licenses that embody them are often indeterminate as to who may benefit from improvements in technology. That is, as technology improves, it becomes feasible to make the overall interference environment more hospitable to additional spectrum use, but it may be unclear whether the right to capitalize on that additional use “belongs” to an existing licensee, or should instead be reserved for future allocation or assignment by the Commission. Adopting explicit interference immunity specifications establishes a public “boundary” on the radiofrequency rights that are granted as part of each license. The existence of the boundary, in turn, creates two new possibilities: first, that the Commission may act to create underlay services without affecting the incumbent’s rights as long as the underlay stays on the public’s side of the boundary; and second

⁸ Testimony of Dr. Paul Kolodzy before The U.S. Senate Committee on Commerce, Science, and Transportation, March 6, 2003 (emphasis added).

(either in addition or alternatively), that incumbent licensees may desire on their own to create such an underlay on the “private commons” model, by improving their own RF plans and leasing their “unused” spectrum rights in the secondary market.⁹

This “boundary” function of receiver performance standards is, therefore, essential to a number of the Commission’s longer-term strategies for increasing spectrum access. The Commission hopes to foster the establishment of secondary spectrum markets, but in most services it is unclear exactly how much “leftover” authority a licensee may properly sell or lease to a third party. Likewise, the creation of licensed and/or unlicensed underlay services and the deployment of cognitive radios must currently be treated under the co-frequency sharing paradigm, which typically includes relatively unproductive debate about somewhat subjective assessments of how much each service should be constrained. Such debates are inevitable when boundaries are not clear, but the establishment of RF boundaries based on interference immunity performance as well as transmitter characteristics can clarify what rights have been assigned to incumbents and what rights remain with the public.

Microsoft believes that robust, reasonably priced broadband networks are essential to the development of new products and services that improve productivity, enrich people’s lives, and deliver benefits to every sector of society and the economy. Wireless technologies –

⁹ Obviously, as a legal matter, the Commission can always act to create an underlay service; no licensee has spectrum rights that exclude this possibility. See 47 U.S.C. § 304. The absence of boundaries, however, makes this a relatively unattractive undertaking for the Commission, and almost totally forecloses any chance that the incumbent will act to create a “private commons.” With boundaries, the public has two strong chances that the unused capacity of the band will be placed in service. Without boundaries, the Commission and the incumbents find themselves at odds, and there is a reasonable prospect that the band will remain chronically underutilized.

particularly innovative technologies operating in primary “unlicensed” bands,¹⁰ unlicensed underlays, “private commons,” and licensed underlays – can play a critical role in bringing broadband services to more Americans than previously thought possible. However, wireless broadband networks cannot continue to grow without access to additional spectrum, and the vast majority of the most promising spectrum is already being used – sometimes only lightly – by another service. The best way to achieve more robust utilization of such bands is for the Commission to delineate more clearly the boundaries where private rights and public prerogatives meet. Interference immunity specifications help to effect this demarcation, which is critical if the Commission wishes to allow spectrum to be reused by unlicensed devices or underlay services.

The *NOI* also discusses the only potential disadvantage of adopting such specifications – the possibility that they may increase the cost of receivers. While this is certainly a possibility, three points should be made. First, the Commission already implicitly assumes a certain minimum level of receiver performance whenever it authorizes a new service; there is no reason to think that the practical necessity of building receivers that can withstand interference will suddenly become onerous just because the minimum capabilities of the receivers are made explicit. Second, it is important to recognize that there is also a cost to *not* imposing interference immunity specifications. Currently, it is often the case that neither users nor licensees have any incentive to take advantage of improvements in receiver technology. That may make the receivers cheaper, but “[t]he hidden cost in this scenario is that few, if any, others can make simultaneous use of this

¹⁰ As a legal matter, the use of these bands is licensed by rule rather than by individual license – the use of the bands is not really “unlicensed.”

valuable commodity known as spectrum.”¹¹ And finally, if we try to generalize across virtually all services in virtually all bands, it is evident that equipment becomes cheaper over time and spectrum becomes subject to greater demand over time; there is no reason to expect any reversal of either trend. Thus, there may have been a time when the usable portions of the spectrum were largely vacant and the central policy problem was how to keep the cost of receivers low, but if so that time is now past. The Commission should act now to address our chronic underutilization of spectrum and to foster broadband deployment.

II. THE COMMISSION SHOULD PREFER INTERFERENCE IMMUNITY SPECIFICATIONS BASED ON INTERFERENCE TEMPERATURE OR ANOTHER EQUALLY GENERAL PERFORMANCE METRIC

Assuming that the Commission decides to impose interference immunity performance specifications, the *NOI* asks which parameters are the most important for the Commission to consider in detail.¹² Microsoft urges the Commission to specify the desired levels of interference immunity in the most general terms that can reasonably be applied in any given situation. While this may require direct regulation of individual receiver parameters in some situations, it would be better where possible to base immunity specifications on “interference temperature.”¹³ That is, the Commission should pursue specifications that expressly quantify the in-band and out-of-band

¹¹ Unlicensed and Unshackled: A Joint OSP-OET White Paper on Unlicensed Devices and Their Regulatory Issues by Kenneth R. Carter, Ahmed Lahjouji and Neal McNeil; May 2003, pg 46.

¹² *NOI* ¶¶ 14-17.

¹³ *SPTF Report* at pp. 27-30.

interference temperatures at which receivers will be assumed to be capable of operating without suffering harmful interference.¹⁴

The most important reason for the Commission to develop an immunity specification based on interference temperature is out of respect for the power of innovation. Innovation is the key to improved performance at a reasonable price, but for it to occur manufacturers must be able to take advantage of new hardware designs, software methodologies, and new technologies as they become available. Specifying particular receiver parameters (such as selectivity, sensitivity, dynamic range, automatic RF gain control, shielding, modulation method, and signal processing) may be the appropriate approach in specific circumstances. But specifying limits for these parameters would, in the main, tend to constrain design choices more than specifying interference temperatures. If the Commission specified the interference temperature environment in which the receiver must operate, communications systems engineers would have greater opportunity to achieve desired outcomes in various ways, trading design parameters as they thought best. This would allow product differentiation and encourage cost reduction. For example, one manufacturer might choose to design a product with narrowband modulation and high selectivity, while another might choose to design a product with spread-spectrum modulation and relaxed selectivity. Both products could be designed to provide the same communications performance and interference immunity. It is not obvious which approach is more cost-effective.

¹⁴ The anticipation of a further proceeding on “interference temperature” may have given many non-technical observers the impression that the metric does not yet exist. The “interference temperature” metric does exist, although the particular values for a given band and service may well require further inquiry.

This point demands some subtlety, because sometimes a healthy respect for the power of innovation can lead policymakers to shy away from imposing *any* technical specifications. But *laissez faire* is not the ideal result either: the Commission’s very existence as a spectrum manager is based on the principle that the public interest will be advanced if someone harmonizes conflicting uses. This is done through the allocation table, through the various assignment processes, and, as importantly, through the adoption of technical rules that optimize different bands for different types of applications. What makes the interference temperature metric so intriguing is that it mediates this tension between micromanagement and *laissez faire*. The interference temperature metric allows the Commission to demand state-of-the-art performance while leaving ample room for innovation, and it does this by specifying a “what” but not a “how” – *i.e.*, specifying an overall result in terms of contribution to interference temperature, but leaving system and hardware engineers with the flexibility to meet that specification in whatever way seems best to them.

The interference temperature approach would also advance some of the Commission’s longer-term spectrum management policies. Both the *SPTF Report* and the record on which it is based suggest that “interference temperature” may provide an approach to improving interference immunity in both primary unlicensed and underlay spectrum.¹⁵ With interference temperature as the cap on potential interfering emissions, more devices could share a given band. Smart transceivers would be able to take advantage of immunity specifications based on interference temperature to determine when the RF environment permits “opportunistic” use of unused or

¹⁵ *SPTF Report* at 27-30.

underused spectrum. Spectrum users would effectively self-regulate the interference temperature in each geographic area and band. This is potentially the ideal paradigm for *ad hoc* mesh networks of the sort that Microsoft envisions.

Microsoft therefore proposes that the Commission pursue interference immunity performance specifications of the following form:

A radio receiver operating in this band shall not be entitled to protection from transmitters operating in the same band or in different bands; and in the same service or in different services unless said receiver is capable of normal operation when operated in the presence of an interference temperature environment specified by:

In-band: A degrees-K

Out-of-band: B degrees-K

The adoption of specifications in this form would create a common framework across receivers used with different services and across devices that use different modulation techniques.

However, the values of the parameters A and B could be different for each band, depending on the services already licensed in that band, and on the operating frequency. In some bands it may be appropriate to specify additional interference temperature ranges and values.

Although immunity specifications based on interference temperature appear to be the most promising at this time, it may be necessary in some instances for the FCC to pursue other approaches. There is no need to be dogmatic about any one metric, particularly at this stage in the Commission's inquiry. The Commission may find, for example, that it is fairly easy to use interference temperature in bands where allocations or service rules are newly adopted, but

significantly more difficult in “legacy” bands. The Commission might then consider whether some more specific requirement (*e.g.*, a requirement to use digital modulation) made more sense in some or all of these latter bands. Or, the Commission may find after further inquiry (and perhaps some early experience) that direct specification of particular parameters is undesirable but another highly generalized receiver performance metric works better than interference temperature. No matter which of these approaches is most appropriate as a general rule, the FCC may find it necessary to make exceptions to deal with the consequences of market failure, or to pursue some particular public interest goal. Such possibilities ought not to be foreclosed at this point. As a matter of sound spectrum management, though, the important thing is for the Commission to begin attaching immunity specifications of some sort to the allocations, service rules, and licenses it issues, and to do so in a way that strikes the best balance between the need for more intensive spectrum use and the power of innovation.

III. THE COMMISSION CAN MAKE ITS IMMUNITY SPECIFICATIONS SELF-ENFORCING BY LINKING THEM TO INTERFERENCE PROTECTION.

The NOI sets forth three possible models for the establishment of interference immunity specifications: “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.”¹⁶ The Commission expresses a preference for voluntary industry standards, apparently based primarily on the ease with which such standards can be updated over time; however, the

¹⁶ *NOI* ¶ 18.

Commission states that either of the other two models may sometimes be more appropriate in particular cases.¹⁷

The Commission's preference for a voluntary approach is understandable, but misplaced. As the Commission's own discussion suggests, voluntary standards will probably not be sufficiently stringent if they are developed by incumbents, who will generally have little or no incentive to tighten their own design specifications in order to make room for additional services that do not benefit them – possibly even competing services. Moreover, experience suggests that for all their benefits and importance, industry standards processes can often be as lengthy and politically driven as any regulatory proceeding. The second alternative – OET Bulletins with “advisory” standards – is similar in that advisory standards may simply be ignored if there is no legal or practical sanction behind them. At the other extreme, the Commission's desire to avoid the need for periodic rule updates is understandable, even though the difficulties of that course are far from insurmountable.

Microsoft believes, however, that the choice between voluntary and mandatory standards is to some extent a false dichotomy, and that the Commission can have stringent yet self-enforcing rules without any need for periodic updates of the various performance specifications. Toward this end, Microsoft urges the Commission to consider an approach whereby the Commission sets out minimum performance requirements *once*, either in service rules or in licensing orders; but any further tightening of performance specifications is expected to come from industry.¹⁸ This solution

¹⁷ *NOI* ¶ 19.

¹⁸ The Commission is also correct in its assessment that it possesses ample legal authority to impose performance standards on licensees and/or manufacturers. Here again, from the fact that interference requires both a transmitter and a receiver, it follows that the Commission's statutory responsibility
(continued....)

could be enabled, for example, by the “boundary” created by an immunity specification based on interference temperature.

Creating a boundary of the spectrum rights conferred by a license gets beyond the voluntary/mandatory dichotomy and replaces it with enlightened self-interest. If a licensee is only entitled to protection from interference that would be harmful to a *compliant* receiver, then it is not necessary to require that all receivers be compliant because the user will be obliged to accept any interference that results from non-compliance. Thus, the enforcement problem disappears, because in the event of a “violation,” it is Mother Nature that imposes the penalty of interference (with notoriously limited rights of appeal). Licensees would be entitled to use inferior receivers if they didn’t mind the interference (or if they intended to operate in an environment where the interference was unlikely to exist), just as people are currently free to buy cheap FM tuners that fail to tune to nearby broadcast stations. But they would *not* be entitled to exclude others’ use of the spectrum in order to prevent the resulting interference.¹⁹ Since the only *public* policy problem is the exclusion of other uses (the interference being a self-inflicted wound), this approach solves the compliance problem as fully as it needs to be solved.

This “boundary” approach would also solve the update problem by putting in place an incentive for industry to innovate. Under current law, incumbents have little or no incentive to

(...continued from previous page)

for managing interference between users of the RF spectrum gives it the power to regulate one side of the interference equation as much as the other.

¹⁹ Cf. 47 C.F.R. § 25.210(c) (“Earth station antennas licensed for reception of transmissions from a space station in the fixed-satellite service are protected from interference caused by other space stations only to the degree to which harmful interference would not be expected to be caused to an earth station employing an antenna conforming to the referenced patterns defined in paragraphs (a) and (b) of this section . . .”).

cooperate on improvements in interference immunity performance because the benefits of any improvement will not, or at least may not, be enjoyed by the incumbents; instead, the Commission may assert public ownership of the “new” capacity that has been freed up, and may allocate or assign it to new and possibly competing entrants. However, once the Commission has bounded the incumbents’ licenses based on assumed minimum performance specifications, the incumbents might voluntarily improve those specifications, in order to use the “new” capacity themselves or lease it or sell it pursuant to the Commission’s policies on secondary spectrum markets. Presumably the incumbents would make the voluntary improvements where the benefits of the additional capacity outweigh the costs of improving the receivers; otherwise not. And because this cost-benefit calculation need not be filtered through the political process, it is likely to be more accurate than a rulemaking would be.²⁰

The “boundary” approach has its most obvious application to bands in which the receivers are themselves licensed, but as the *NOI* notes, there are some bands (like the broadcast bands), in which the receivers may not be under the control of any licensee. Even in broadcast and similar bands, however, the boundary approach should provide a useful incentive structure. Once broadcast licenses have been bounded with an interference immunity specification that quantifies the amount of interference that must be tolerated, the licensees will all have the same incentive to prod manufacturers into making tuners that are capable of receiving the broadcast signal even in the presence of an underlay signal. Broadcasters, whose interest is in attracting as

²⁰ Naturally, the possibility of market failure cannot be ruled out, and it may be necessary in isolated cases for the Commission to step in and update the receiver specifications. However, one would expect such cases to be the exception, such that updating would not often require Commission involvement.

many eyeballs (or eardrums) as possible and who therefore need to balance reception against cost, are perfectly situated to adopt minimum immunity performance characteristics if the benefits of doing so outweigh the costs. Manufacturers may then produce compliant tuners that can be advertised as compliant, or cheaper non-compliant tuners, or both, as the market dictates.

Furthermore, the boundary approach carries with it the additional benefit of facilitating the creation of additional underlay spectrum for licensed or unlicensed use. A voluntary approach simply cannot produce the same benefits in this regard, because incumbents have no incentive to spend their time and money making room for an underlay; indeed, the prospect of an underlay may be a very significant *disincentive* to any agreement at all.

The application of the boundary approach to existing bands is unfortunately not as easy as in any “new” (*i.e.*, vacant or reallocated) spectrum. Obviously, the specifications would ideally be phased in over time to allow existing equipment to become obsolete. Consumers might need to be protected by requiring manufacturers to supply information about compliance, or non-compliance, and the date at which protection will be denied to non-compliant devices. This would undeniably be a complicated undertaking in any band with a large number of legacy receivers. However, it should be noted that the boundary approach is no *worse* in this regard than any other approach suggested in the *NOI*. And the Commission need not impose interference immunity specifications on legacy services at the same time that it begins to impose them on new services, so the difficulty of doing *everything* now should not deter the Commission from making a good start.

Thus, while it may be politically and administratively attractive to rely exclusively on voluntary programs, it is not in the public interest to do so. Establishing shared, public

expectations about receiver tolerance for interference (and in so doing, establishing the precise contours of the license in question), and *then* letting market forces take over is the better path. This approach provides substantial 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.

IV. THE COMMISSION SHOULD MOVE QUICKLY TO BEGIN SERVICE-BY-SERVICE DEVELOPMENT OF INTERFERENCE IMMUNITY SPECIFICATIONS.

The *NOI* reflects the Commission’s suggestion that “it appears more tractable” to group the various communication services so as to require a smaller number of different standards.²¹ Based on that premise, the Commission asks for “suggestions regarding the services and/or receiver types with which to begin and how we should organize the process for defining immunity specification.”²² Microsoft urges the Commission to begin adopting service-by-service specifications sooner rather than more general standards later, for at least two reasons.

First, it is by no means clear that the general standards presupposed by the Commission will ever be developed. After all, the Commission has been explicitly regulating transmitter parameters for decades, yet there is little evidence to suggest even now that the multitude of resulting transmitter rules could be usefully reduced to one for broadcast, one for satellites, one for mobile phones, *etc.* With the benefit of the new interference temperature metric, it may well be that in time the Commission’s new interference immunity specifications will coalesce into identifiable groups – either the groups the Commission mentions in the *NOI* or others that suggest

²¹ *NOI* ¶ 24.

²² *NOI* ¶ 24.

themselves. However, the significant and immediate benefits of imposing immunity specifications should not be sacrificed for a period of many years on the mere chance that this will occur.

Microsoft therefore urges the Commission not to delay the imposition of service-specific rules for the relatively long time that would be required to develop a generic or comprehensive standard that could be applied to multiple services.

Second, any Commission attempt to derive a single rule for a group of similar services (or a small number of rules for all services) would very likely bog down over questions of incumbency. Both the NOI and these Comments have noted that the development and application of immunity specifications is more difficult for bands in which there are a large number of existing receivers. Without question, the easiest way to introduce the new approach is to introduce it into a vacant or reallocated band in which a new service is being established. Since the establishment of underlay services appears to depend critically upon the ability to define the boundary of a licensee's protection from interference, every new allocation that the Commission approves without specifying an interference immunity condition represents a lost opportunity.

In light of these considerations, service-by-service consideration is the soundest approach. The Commission should take the opportunity presented by early individual cases, possibly including some that are now pending, in order to gain experience with the interference immunity concept and avoid undue delay. Only with the light of experience should the Commission devote itself to the task of discerning more general rules.

CONCLUSION

The Commission, by implementing appropriate interference immunity performance specifications, can create the conditions that would allow widespread deployment of unlicensed

broadband networks. In doing so, the Commission will help jumpstart the kind of broadband deployment that Chairman Powell has described as the “central communications policy objective in America today.”²³

Respectfully submitted,



Paula H. Boyd
Marc Berejka
MICROSOFT CORPORATION
1401 Eye Street, N.W., Suite 500
Washington, D.C. 20005
(202) 263-5946

Scott Blake Harris
Mark A. Grannis
HARRIS, WILTSHIRE & GRANNIS LLP
1200 Eighteenth Street, NW
Washington, D.C. 20036
(202) 730-1300

Counsel to Microsoft Corporation

Mark A. Sturza
3C SYSTEMS COMPANY
16161 Ventura Blvd., Suite 815
Encino, California 91436
Consultant to Microsoft Corporation

21 July 2003

²³ *State of Competition in Telecom Industry: Hearing Before the Senate Comm. On Commerce, Science, and Transportation, 108th Cong. 12 (2003) (written statement of Michael K. Powell, Chairman, FCC), available at <http://commerce.senate.gov/~commerce/press/03/powell011403.pdf>.*