

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

In the Matter of)
)
Petition for Rulemaking filed by Loea) RM-10288
Communications Corporation to Amend the)
Commission's Rules for the Point-to-Point Use)
of the 71.0-76.0 GHz and 81.0-86.0 GHz Bands)

**COMMENTS OF
THE BOEING COMPANY
TO PETITION FOR RULEMAKING**

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October 29, 2001

SUMMARY

Boeing strongly supports the Petition for Rulemaking submitted by Loea Communications Corporation (“Loea”) requesting that a Notice of Proposed Rulemaking (“NPRM”) be issued under Part 101 to establish licensing and service rules in the upper millimeter wave frequencies above 70 GHz in the 71.0-76.0 GHz and 81.0-86.0 GHz frequency bands (“W-bands”). Further, Boeing asks that the Commission also include the 92.0-95.0 GHz frequency band in any NPRM. Boeing has developed a similar millimeter wave technology applicable to fixed wireless applications that can operate in the 92.0-95.0 GHz frequency band.

Boeing agrees with Loea that the full bandwidth in the W-bands must be made available as the maximum authorized bandwidths. These proposed upper millimeter wave technologies operate at low powers in the form of pencil-sized beams similar to lasers. In order to achieve the maximum possible transmission rates, as high as 10 Gbps, the full bandwidths, as much as 5 GHz, must be made available. Segmenting the bands will deny Boeing and others the ability to realize these very high data transmission rates.

The nature of these technologies requires that any licensing scheme be done on a site-by-site basis without competitive bidding. Because these technologies take the form of pencil-size beams, it appears possible to license almost an infinite number of providers in any of the three proposed bands. In other words, there is not a scarcity of spectrum that would result in mutually exclusive applications and, therefore, competitive bidding. Licensing on a geographic basis, however, will not maximize spectrum use and efficiency, but rather delay their deployment and create unnecessary barriers to entry. Mutually exclusive licensing can and should be avoided.

Finally, Boeing requests that any Notice of Proposed Rulemaking consider technical parameters that permit other providers to be licensed in these bands. Loea proposes a set of technical parameters that, it would appear, reflect its proposed system but do not seek to maximize compatibility with other systems and services. Any adopted technical parameters should be independent and neutral as to any proposed system for the spectrum in question.

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The Boeing Company (“Boeing”), by its attorneys and pursuant to section 1.405 of the Commission’s rules, 47 C.F.R. § 1.405, hereby presents its comments to the Petition for Rulemaking (“*Petition*”) filed by Loea Communications Corporation (“Loea”) in the above-referenced rulemaking proceeding.¹ For the reasons set forth herein, Boeing expresses its support for the issuance of a Notice of Proposed Rulemaking to establish allocation, licensing and service rules in the upper millimeter wave frequencies above 70 GHz (“W-bands”) under Part 101 of the Commission’s rules, 47 C.F.R. Part 101.

I. INTRODUCTION

Boeing strongly supports Loea’s proposal to allocate spectrum and establish rules for fixed wireless, point-to-point applications in the upper millimeter-wave frequencies above 70 GHz. Boeing has recently been refining millimeter wave technology applicable

¹*In the Matter of Service Rules for the Point-to-Point Use of the 71.0-76.0 GHz and 81.0-86.0 GHz Bands*, Petition for Rulemaking, Loea Communications Corporation, RM-10288 (rel. September 27, 2001) (“*Petition*”).

to fixed wireless applications, including in the 92.0-95.0 GHz band, and has demonstrated 3-5 Gbps data rate capability. Boeing is further exploring the possibilities of increasing the data rates in these upper millimeter-wave frequencies. Consequently, Boeing urges the Commission to issue expeditiously a Notice of Proposed Rulemaking (“NPRM”) for its Part 101 rules in response to Loea’s *Petition*. Any such NPRM should also encompass licensing and service rules for the 92.0-95.0 GHz frequency band.

The Commission has previously noted that “the large amount of spectrum available at these frequencies can accommodate the wide channel bandwidth that is needed for the rapid transmission of large volumes of data.”² Further, the Commission has indicated its belief that millimeter wave technology could accommodate high-resolution video, transfer of sizeable databases and serve as a communications backbone complementary or independent of fiber.³ While these comments were made regarding the frequencies in the 40 GHz range, their applicability is equally or more valid for the upper millimeter wave frequencies in the W-band.

Despite some shortcomings, the attractiveness of this higher frequency spectrum is that it offers substantially wider absolute bandwidths than available at lower frequencies. Studies have shown that such contiguous wideband spectrum is needed in order to provide sufficient bandwidth for the many evolving communications applications being planned not only for wideband fiber extension but also for fiber substitution where the deployment of radiofrequency services would be more economical and occur more quickly. Accordingly, any segmentation in these higher bands would greatly limit the

² *In the Matter of Amendment of Parts 2 and 15 of the Commission’s Rules to Permit Use of Radio Frequencies Above 40 GHz for New Radio Applications*, ET Docket No. 94-124, Notice of Proposed Rulemaking, 9 FCC Rcd 7078, 7082 ¶ 9 (1994).

opportunities offered in these existing allocations, including opportunities for competitive applications to best serve the public.

To achieve the objective of retaining maximum bandwidths for all services as intended by the original allocations, any NPRM should require interservice compatibility in order to achieve a high degree of sharing. W-band frequencies offer more attractive sharing possibilities than in most lower bands, because the smaller wavelengths at higher frequencies can result in very narrow antenna bandwidths that would far exceed similar performance in lower bands. This should lead to the conclusion that agreements on sharing criteria in the W band would be more easily realized. In contrast, previous approaches generally relied on band segmentation, thus resulting in a reduction of usable capacity. The Commission should not now allow such outcomes to be repeated in the W-band or it runs the risk of greatly compromising the potential market opportunities and public benefits of utilizing the W-band for these new technologies.

Finally, in any NPRM, the FCC should seek to achieve intersystem compatibility while maximizing band use and aggregate capacity of the competing and diverse services. Such band use must be predominantly directed toward system implementations that offer the highest degree of spectrum reuse.

II. THE COMMISSION SHOULD INCLUDE THE 92.0-95.0 GHz FREQUENCY BAND IN ANY NPRM ADDRESSING LOEA'S PETITION FOR RULEMAKING

Any NPRM released in response to Loea's *Petition* should also include the 92.0-95.0 GHz frequency band.⁴ While the projected long-term requirements for needed

³ *Id.*

⁴ Boeing also urges the Commission to align the domestic table of frequency allocations, 47 C.F.R. § 2.106, for the fixed service in 75.5-76.0 GHz frequency band as soon as

capacity exceed the full amount of spectrum available in this band, Boeing believes that the market for these systems can be demonstrated and developed now in the 92.0-95.0 GHz band through assignments on a site-by-site basis even though the Commission currently lacks specific licensing and service rules for frequencies above 40 GHz. Moreover, including the 92.0-95.0 GHz band in any NPRM would be consistent with proposed use advocated in recent industry discussions. This band has similar propagation characteristics to other W-band frequencies. For relatively small physical apertures, the band offers the possibility of high gain and high isolation antennas due to a very small wavelength. In addition, there has been significant hardware development work undertaken to date in order to make this band technically attractive and viable.

III. THE COMMISSION SHOULD LICENSE THE ENTIRE BANDWIDTHS IN THE W-BAND FREQUENCIES AS THE MAXIMUM AUTHORIZED BANDWIDTHS

Loea proposes that any licensing and service rules adopted by the Commission permit use of the entire available bandwidths as the maximum authorized bandwidths in the 71.0-76.0 GHz and 81.0-86.0 bands.⁵ Boeing strongly agrees with this proposal and asks that such a rule also be adopted for the 92.0-95.0 GHz frequency band.⁶ Boeing also contends that there are significant technical and market factors that support such a rule.

In order to provide very high, fiber-like data transmission rates, the entire available bandwidths of these W-band frequencies are needed. Transmission rates as high

possible with the United States' proposal to the 2000 World Radiocommunication Conference ("WRC-00"). This proposal was virtually adopted in its entirety by WRC-00 without any major modifications.

⁵ *Petition* at 11-13.

⁶ If eventually there is sufficient market demand, unlicensed applications could be permitted pursuant to Part 15 of the Commission's rules, 47 C.F.R. Part 15.

as 10 Gbps may be possible, but only if the entire bandwidths are made available to any licensee. Any segmentation within each band for less than the maximum available bandwidth would deny potential licensees the ability to realize the fiber-like data transmission rates that are possible in these bands. Accordingly, Boeing proposes that any licensing and services rules for these W-band frequencies not provide for any segmentation.

There are also market reasons why the entire available bandwidths must be authorized as the maximum bandwidths without any segmentation. Boeing believes fixed wireless point-to-point systems in these bands are a “next-to-last-mile” technology that will both complement and compete with fiber. To date, fiber communication has had a significant advantage over existing wireless applications because of its wide-band capabilities for higher transmission rates. The expense of deploying fiber, however, outside areas of high traffic concentration, such as in urban environments, imposes substantial economic limitations. A gigabit wireless fixed service can be a complementary service that potentially offers near fiber-like capacity at competitive cost. For example, telecommunications companies and others with very high data rate transmission needs could connect urban fiber rings with suburban and rural communities not otherwise served by fiber. Such a system could also replace fiber in urban areas in order to avoid the cost and delays associated with deploying fiber, for example, under city streets. But for all potential licensees in the W-band, the entire available bandwidths in these frequency bands must be the maximum authorized bandwidths without any segmentation if true equivalence and compatibility with fiber is to be achieved.

The economic incentives to provide fiber-like services beyond the economically viable reach of fiber require that segmentation of the W-bands be avoided and that sharing among a diversity of services be promoted. Furthermore, segmented bands in the fixed services recently made available below 70 GHz are still available. These bands are currently more than sufficient for meeting the needs of the low and moderate bandwidth uses. This strongly argues that segmentation of frequencies in the higher than 70 GHz band regions should be avoided.

IV. ANY ADOPTED LICENSING SCHEME SHOULD BE DONE ON A SITE-BY-SITE BASIS WITHOUT COMPETITIVE BIDDING

Loea's proposed W-band system would use a point-to-point architecture designed to provide "infrastructure" services to those with very high data transmission rates needs.⁷ These would likely not be consumer services. Nor do the technical characteristics of the narrow-beam, point-to-point applications proposed by Loea implicate mutually exclusive licensing situations. Accordingly, geographic licensing that results in competitive bidding is inappropriate. Boeing agrees that licensing should be authorized instead on a site-by-site basis under Part 101 of the Commission's rules.⁸

The nature of the system proposed by Loea is best suited for site-by-site licensing as it is designed to offer point-to-point service over limited distances. While the required bandwidth may be as much as 5 GHz, the physical size of the transmission is small. Loea

⁷ *Petition* at 6-7.

⁸ 47 C.F.R. Part 101. Part 101 already includes rules for point-to-point microwave services in Subpart H (private operational fixed point-to-point microwave service) and Subpart I (common carrier fixed point-to-point microwave service). While Part 101 addresses services only up to the 40 GHz band, frequencies above 40 GHz are specifically referenced for microwave services. 47 C.F.R. § 101.147(a). Part 101, therefore, offers a logical place to license these upper millimeter wave technologies in the W-band.

describes its system as utilizing “pencil-sized beams.”⁹ These beams, resembling lasers, travel in straight lines. In contrast to most other wireless services, the small physical size and limited distance of such systems permit the licensing of almost an infinite number of providers in any of the three proposed bands. Potential interference can be easily avoided through prior coordination that results in the physical separation of licensees, even where collocated. As described by Loea, an antenna angle of only a few degrees, or less, differentiation is sufficient to avoid interference.¹⁰ Moreover, because individual licensees could be located so closely together, it would be possible to authorize many more operators in a given geographic area. In contrast, geographic licensing would have the opposite effect: the licensee would occupy only limited spectrum but leave the remaining spectrum in that area fallow and restricted from other users. In effect, exclusive geographic licensing would result in an uneconomical use of the spectrum. Site-by-site licensing, in this instance, would actually result in a better maximization of spectrum use.

If the Commission were to rush now toward imposing an auctioning regime, it would serve only to retard the potential market for these upper millimeter wave services. Potential licensees would be asked to pay for something without knowing what they would be getting. While Loea’s proposed system in the W-band appears to have worked in several testing environments, the market needs and potential demands for it are still being determined. Boeing supports the conclusions reached in the economic study

⁹ *Petition* at 8.

¹⁰ *Id.* at 17.

provided by Loea as part of its application.¹¹ This study determined that site-by-site licensing in the W-band would result in the “efficient and rapid” deployment of these proposed systems and services.¹² Further, “the conditions for spectrum auctions [are] not present given the nature of the spectrum involved and the technology that will be used. An auction will only cause a delay and may lead to an inefficient market structure.”¹³ “Competitive bidding for the spectrum as well as use by its competitors is not necessary and counterproductive.”¹⁴ Therefore, Boeing contends that licensing in the W-band across broad geographic swaths, which would necessarily result in mutually exclusive applications and competitive bidding, would only impose additional and unnecessary costs, both in terms of real dollars and delay, in the deployment of these new technologies.¹⁵

Boeing is aware that there is limited federal government use of the 3 GHz of bandwidth in the 92.0-95.0 GHz frequency band. Licensing on a geographic basis would make it very difficult to coordinate commercial and government usage in order to avoid interference and result in unnecessarily fallow spectrum in order to avoid the government usage. With appropriate technical parameters for these upper millimeter wave

¹¹ A. Daniel Kelley, HAI Consulting, Inc., “Economically Efficient Licensing of the Millimeter Wave Band,” Appendix B to *Petition* (September 5, 2001).

¹² *Id.* at 1.

¹³ *Id.*

¹⁴ *Id.*

¹⁵ Boeing agrees with Loea that the new “band manager” concept is inappropriate for licensing in the 71.0-76.0 GHz and 81.0-86.0 GHz frequency bands. *Petition* at 16. It is equally inapplicable for the 92-95 GHz band. Boeing believes that utilizing the band manager mechanism would impose additional costs on the actual licensees of these bands. Band managers would seek to maximize their investment by, among other steps, segmenting the bands. As described above, segmenting these bands would create significant technical obstacles for potential licensees in these bands.

technologies, it would be very feasible to coordinate usage between licensees in order to avoid interference.

Finally, the Commission retains sufficient authority and discretion to decide to award licenses on a site-by-site basis. Section 309(j)(1) of the Communications Act, as amended,¹⁶ is often read in isolation. Section 309(j)(6) provides the “Rules of Construction” the Commission is to follow when reviewing the licensing parameters for new radiofrequency services, providing in relevant part:

Nothing in this subsection, or the use of competitive bidding, shall –

...
(E) be construed to relieve the Commission of the obligation in the public interest to continue to use engineering solutions, negotiation, threshold qualifications, service regulations, and other means in order to avoid mutual exclusivity in application and licensing proceedings.¹⁷

Boeing notes that the Commission is explicitly required to consider these factors as a condition to imposing any competitive bidding process.¹⁸ In the case of the W-band, these factors should lead to a determination that mutually exclusive licensing can be easily avoided.

¹⁶ 47 U.S.C. § 309(j)(1).

¹⁷ *Id.* at § 309(j)(6)(E). Subsection (G) also instructs the Commission to consider awarding licenses without competitive bidding to “those persons who make significant contributions to the development of a new telecommunications service or technology.” *Id.* at § 309(j)(6)(G).

¹⁸ *See id.* at § 309(j)(1) (“If consistent with the obligations described in paragraph [47 U.S.C. §309(j)9(6)(E)] ... the Commission shall grant the license or permit through a system of competitive bidding that meets the requirements of this subsection.”).

V. THE COMMISSION SHOULD INCLUDE OTHER SETS OF TECHNICAL PARAMETERS THAN THOSE PROPOSED BY LOEA IN ANY NPRM

Loea's Petition includes proposed technical parameters for new Part 101 rules that appear to be taken from systems used at lower frequencies.¹⁹ While the proposed parameters may be satisfactory for Loea to realize its system, it is not clear what impact these parameters would have on systems different from the Loea application. Boeing, therefore, recommends that any rulemaking ensure that the adopted technical parameters maximize the possibility for spectrum reuse. This should be conducted with the idea of preserving the wideband benefits and opportunities that are possible and unique to the W-band.

Any adopted technical parameters should be independent and neutral as to any proposed system and, thus, accommodate a variety of types of systems and applications for the spectrum in question. Loea's proposed technical parameters reflect their proposed system, which parameters were likely not designed in order to maximize compatibility with other systems and services, but rather to meet Loea's desired performance objectives at an acceptable cost. The Commission should adopt technical parameters that ensure that differing systems and applications are not excluded from accessing W-band frequencies. Independent and neutral technical parameters should be utilized by the Commission as one tool for maximizing spectrum use among competing systems.

VI. CONCLUSION

Boeing strongly supports the issuance of a Notice of Proposed Rulemaking under Part 101 pertaining to the licensing of millimeter wave technologies in the 71.0-76.0

¹⁹ *Petition* at 11, 14 and Appendix C.

GHz, 81.0-86.0 GHz and 92.0-95.0 GHz frequency bands in response to Loea's Petition for Rulemaking. Any such rules should provide that the full bandwidth in each frequency band be made available as the maximum authorized bandwidth. Segmentation within each band will impose significant barriers on the ability to utilize these technologies. Licensing should also be conducted on a site-by-site rather than on a geographic basis that utilizes competitive bidding. Finally, the Commission should adopt technical rules that are independent and neutral, thus permitting the licensing of competing and diverse systems and services.

Respectfully submitted,

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CERTIFICATE OF SERVICE

I, Mark D. Johnson, hereby certify that on this 29th day of October, 2001, I caused a copy of the preceding "Comments of The Boeing Company to Petition for Rulemaking" to be delivered via first-class mail, postage prepaid, to the following:

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