

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

In the Matter of)	
)	
Allocations and Service Rules for the 71-76 GHz, 81-86 GHz and 92-95 GHz Bands)	WT Docket No. 02-146
)	
Loea Communications Corporation)	RM-10288
Petition for Rulemaking)	

COMMENTS OF TERABEAM CORPORATION

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SUMMARY

Terabeam Corporation (“Terabeam”), a manufacturer of millimeter wave equipment, applauds the FCC’s efforts to commercialize the use of the bands 71-76 GHz, 81-86 GHz and 92-95 GHz. In particular, it generally supports the FCC’s allocation proposals. Terabeam disagrees, however, with the FCC’s proposal to add a new footnote regarding the use of the 71-76 GHz band to the Table of Allocations and opposes the addition of a secondary allocation for amateur and AMSAT services in the 81-81.5 GHz bands.

Terabeam supports the Loea proposal to authorize licensees’ use of the entire 71-76 GHz and 81-86 GHz bands for fixed purposes. The FCC should not implement a sharing plan between fixed service use of these bands and other services.

Terabeam recommends that the 71-76 GHz and 81-86 GHz bands be licensed on a site specific basis. A site specific approach would best promote the intense use of the millimeter wave bands and would afford licensees with an expectation of interference free operations. While geographic licensing has proven beneficial for many services, it is not appropriate for the millimeter wave bands and has the potential to create spectrum scarcity or secondary markets where none need exist. Exclusive Use licensing is also inappropriate because the millimeter wave band cannot support a variety of high and low-power fixed and mobile uses. It is equally inappropriate to permit unlicensed operations in the millimeter wave bands, under a Commons Model approach, because such operations do not accord with the expected use of the millimeter wave bands. If the FCC does authorize the use of the millimeter wave band on an unlicensed basis, it should require that entities proposing to use the band register with a third party entity selected by industry or the FCC.

Site specific licensing can be achieved without imposing significant burdens on the FCC. Industry standards can be developed that can predict when a proposed path may cause interference to an existing path. These standards can be included in the ULS processing system to automatically evaluate if a licensee’s proposed authorization will create interference, such that it should be rejected. In the alternative, the FCC could use a third party entity or entities to serve as frequency coordinators or as band administrators for the millimeter wave bands.

Terabeam agrees with the WCA’s recommended approach to coordination in border areas, license terms and renewal expectancy, construction and coverage requirements and application of Title II of the Communications Act. Terabeam endorses WCA’s approach to the technical and operational rules proposed by the FCC, but recommends further refinements to the WCA position regarding antenna gain and beamwidth. In particular, Terabeam recommends changes to two of the notes in the table designed to govern the permissible transmitter power and beam shape for wider beamwidth antennas.

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Terabeam Corporation, by its counsel and pursuant to the provisions of Section 1.415 of the Rules and Regulations of the Federal Communications Commission (“FCC” or “Commission”), 47 C.F.R. § 1.415 (2002), and the invitation extended by the Commission in the above referenced Notice of Proposed Rule Making (“NPRM”),^{1/} hereby submits its comments responsive to the FCC’s proposals designed to promote the commercial development and growth of the bands 71-76 GHz, 81-86 GHz and 92-95 GHz (the so-called “millimeter wave bands”).

I. INTRODUCTION

Headquartered in Kirkland, Washington, Terabeam designs and manufactures broadband wireless systems that extend and optimize carrier and enterprise networks. Terabeam’s systems deliver the speed, capability and connectivity of fiber – with the rapid, flexible, cost effective deployment of wireless technology. Terabeam’s systems use free space optic (“FSO”) and 60 GHz millimeter wave technology. In particular, Terabeam offers millimeter wave technology

^{1/} *In the Matter of Allocations and Service Rules for the 71-76 GHz, 81-86 GHz, and 92-95 GHz Bands*, WT Docket No. 02-146, Notice of Proposed Rulemaking, 17 FCC Rcd 12182 (2002) (“NPRM”).

through its Gigalink series of products. These Gigalink products offer affordable, highly reliable, short and medium range outdoor links at fast ethernet (100 Mbps), OC-3/STM-1 (155 Mbps) and OC-12 SMT-4 (622 Mbps) speed. Terabeam expects to offer equipment using the millimeter wave bands that are the subject of this proceeding. Accordingly, Terabeam is pleased to have the opportunity to submit the following comments.

II. COMMENTS

A. Allocation Proposals

As the Commission notes, all of the current domestic allocations for the 71-76 GHz, 81-86 GHz and 92-95 GHz bands were established at the 1979 World Administrative Radio Conference (“WARC-79”) and were codified in the Commission’s rules in January, 1984.^{2/} Since that time, several international conferences have addressed the use of these bands and the NPRM seeks to conform the FCC’s regulations to these more recent international allocations. Terabeam generally supports the FCC’s proposals. Like the Wireless Communications Association (“WCA”), however, of which Terabeam is a member, Terabeam disagrees with the FCC’s proposal to add a new footnote regarding the use of the 71-76 GHz band to the Table of Allocations. Instead, the FCC should adopt technical standards that will offer the level of protection suggested by WCA. Terabeam, like WCA, also opposes the addition of a secondary allocation for amateur and AMSAT services in the band 81-81.5 GHz. Terabeam agrees with the FCC’s approach regarding coordination of the use of the 81-86 GHz, 92-94 GHz and 94.1-95 GHz with the radio astronomy service (“RAS”).

^{2/} NPRM at ¶ 11.

B. Band Plan

Terabeam supports the Loea proposal to authorize licensees' use in the entire 71-76 GHz and 81-86 GHz band for fixed use.^{3/} Terabeam does not believe that is productive for the FCC to attempt to implement sharing between fixed service use of these bands and other services.

Today, only the fixed services are able to make meaningful use of the 71-76 GHz and 81-86 GHz bands. In the future, if technology advances make the 71-76 GHz and 81-86 GHz bands available for mobile services, for example, the FCC should consider the adoption of regulations for the mobile services at that time. However, it is unnecessary and unproductive for the Commission to consider regulations for other services in the bands today.

C. Service Rules

Although it seeks comments on the use of the 71-76 and 81-86 GHz bands on an unlicensed basis, the Commission appears to favor an approach for those bands which features the use of geographic licensing (and presumably the use of competitive bidding), except in certain circumstances where coordination with Federal government operations may be necessary.^{4/} Terabeam supports the comments of the WCA and recommends that that this spectrum be licensed on a site specific basis. As explained below, in light of the increasing sophistication of the FCC's Universal Licensing System ("ULS"), licensing can occur without significant burden to the Commission. Nevertheless, if the FCC believes that its evaluation of applications will be burdensome, Terabeam recommends the use of a third party band administrator selected by either the FCC or industry to manage the use of the millimeter wave bands.

^{3/} *Id.* ¶ 60. Because Terabeam only has immediate plans to manufacture equipment using the 71-76 GHz and 81-86 GHz band, it does not address the use of the 90 GHz band in these comments.

^{4/} *Id.* ¶ 65.

1. Licensing is Appropriate for the Millimeter Wave Bands

Terabeam agrees with the WCA's proposal that in order to promote the most intense use of the millimeter wave bands, the Commission should issue authorizations to potential users of the spectrum. Terabeam generally supports the availability of spectrum for unlicensed operations; its Gigalink equipment is operated successfully in the unlicensed 60 GHz band. However, carriers and others desire that the Commission also make available spectrum for which there can be an expectation of interference free operations. For certain conditions, the use of unlicensed spectrum, which typically involves low cost implementation and few federal regulatory barriers to initiation of service, is appropriate. Under other circumstances, however, spectrum users require more certainty that their operations will be unlikely to receive interference from others. As advocated by the WCA, the Commission should dedicate these bands for entities that require the use of spectrum under these more demanding circumstances.

2. Geographic Licensing is Inappropriate for the Millimeter Wave Bands

Terabeam supports the WCA's position, that site specific licensing, instead of geographic licensing, can promote best the most intensive use of the millimeter wave bands. The FCC, however, appears to favor the use of geographic area licensing for the millimeter wave bands.^{5/} Terabeam recognizes that geographic area licensing has been very successful in certain Commission services. The Commission notes three benefits to geographic licenses in those services: 1) it affords licensees substantial flexibility to respond to market demand; 2) it allows licensees to coordinate use of spectrum across a broad geographic area; and 3) it allows licensees to adjust spectrum usage based on market demands.^{6/}

^{5/} *Id.*

^{6/} *Id.* ¶ 66.

As WCA pointed out, these benefits have been important in, for example, the mobile wireless services. In those services, geographic area licensing is useful to permit carriers to have the flexibility they require to respond quickly to market demands, by allowing the relocation of base station facilities and spectrum without prior FCC approval.^{7/} Because of the nature of the users of mobile wireless systems, carriers benefit by being able to provide service over a broad geographic area. In fact, in the mobile wireless services, broad coverage area is deemed to be an important service feature.^{8/} Even in other wireless services, where scope of geographic coverage and the ability to dynamically re-use spectrum is deemed to be important, the use of a geographic licensing scheme is both appropriate and beneficial to licensees.^{9/} In each of these cases, the

^{7/} See, e.g., *In the Matter of Revision of Part 22 and Part 90 of the Commission's Rules to Facilitate Future Development of Paging Systems*, WT Docket No. 96-18, Second Report and Order and Further Notice of Proposed Rulemaking, 12 FCC Rcd 2732, 2739, ¶ 6 (1997) (“*Paging Order*”) (adopting geographic area licensing for paging operations because it “provides flexibility for licensees and ease of administration for the Commission, facilitates further build-out of wide-area systems, and enables paging operators to act quickly to meet the needs of their customers.”); *In the Matter of Amendment of Part 90 of the Commission's Rules to Facilitate Future Development of SMR Systems in the 800 MHz Frequency Band; Implementation of Sections 3(n) and 322 of the Communications Act - Regulatory Treatment of Mobile Services; Implementation of Section 309(j) of the Communications Act - Competitive Bidding*, PR Docket No. 93-144, Second Report and Order, 12 FCC Rcd 19079 ¶ 10 (1997) (adopting geographic licensing for the lower SMR bands because “[g]eographic area licensing . . . increase[s] the flexibility afforded to licensees to manage their spectrum . . . [and] reduce[s] administrative burdens and operating costs by allowing licensees to modify, move, or add to their facilities within specified geographic areas without need for prior Commission approval.”).

^{8/} *In the Matter of Year 2000 Biennial Regulatory Review – Amendment of Part 22 of the Commission's Rules to Modify or Eliminate Outdated Rules Affecting the Cellular Radiotelephone Service and other Commercial Mobile Radio Services*, WT Docket No. 01-108, Report and Order, 2002 FCC LEXIS 4669 ¶ 8 (rel. Aug. 8, 2002) (noting “the market demand for nationwide, ubiquitous coverage by [wireless] carriers”).

^{9/} See, e.g., *In the Matter of Amendment of the Commission's Rules Concerning Maritime Communications*, PR Docket No. 92-257, Third Report and Order and Memorandum Opinion and Order, 13 FCC Rcd 19853 (1998) (“*VPC Order*”) (adopting geographic area licensing of VHF public coast stations).

common feature of the service provided is that the use of spectrum in a geographic area by one entity effectively precludes the use of the same spectrum in the same geographic area.

However, as WCA also notes, the use of geographic area licensing is not appropriate in the millimeter wave bands where mobile services are not contemplated, where scope of geographic coverage is not expected to be an important feature of either carrier or private entity operations, and where the use of spectrum by one entity in a geographic area does not necessarily preclude the re-use of that spectrum by another entity. The millimeter wave bands produce highly directional point-to-point “pencil beam” transmissions.^{10/} The extensive use of the millimeter wave bands by one entity does not necessarily preclude the use of the band by another entity in the same broad geographic area.^{11/} Because the use of the millimeter wave band by more than one entity in a wide geographic area is feasible, geographic area licensing is neither desirable nor appropriate.

Indeed, and as the WCA accurately points out, if the FCC adopts a geographic area licensing approach for the millimeter wave bands, it will artificially create spectrum scarcity or secondary markets for spectrum where none need exist. Because a single entity is unlikely to require the millimeter wave spectrum throughout an entire geographic area, and assuming that the FCC permits partitioning and disaggregation of spectrum, a geographic area licensee will be required to engage in partitioning or disaggregation in order for the millimeter wave spectrum to

^{10/} NPRM ¶ 65.

^{11/} Nevertheless, as noted above, unlicensed use of the millimeter wave bands is not favored because of the desire to secure communications capability comparatively free of co-channel interference.

be most intensively employed.^{12/} If, however, the FCC simply permitted site specific licensing of the millimeter wave band, it would avoid requiring the potential users of the spectrum to incur the transactional costs that would necessarily be involved in using spectrum on a partitioned or disaggregated basis.

Similar unnecessary transactional costs would be imposed on potential users of the millimeter wave band if the FCC adopts band-manager licensing of this spectrum. Assuming that band managers would be required to obtain their authorizations through competitive bidding, they would be motivated to at least recapture the costs of obtaining their authorizations, and at most, profit from the management of the spectrum. This approach may be attractive for the coordination benefits it would provide – allowing multiple entities to employ the spectrum potentially in the same geographic area – but it would impose unnecessary costs on spectrum users. As explained below, the same results – the use of spectrum in the same area by different users – can be achieved by means that do not impose burdens on spectrum users.^{13/}

Terabeam is mindful that the Commission’s Spectrum Policy Task Force (the “Task Force”) recently issued a Report that generally favors the use of an “Exclusive Use” or “Commons” approach to spectrum allocation and disfavors the “Command and Control” method

^{12/} The Commission has permitted other mobile services to partition and disaggregate their geographic licensing area. *See, e.g., Paging Order* at ¶ 192; *VPC Order* at ¶ 11.

^{13/} As noted below, Terabeam does not object to the management of the spectrum by one or more band administrators appointed by the FCC or selected by industry. The band administration concept Terabeam endorses, however, is different from the band managers currently licensed (and proposed) by the FCC. Those band managers, required to obtain their authorizations through auction, must necessarily recover the cost of obtaining their authorizations, thereby imposing an unnecessary transactional cost on the use of this spectrum. The band administrators are also different from those referenced in the UDELWG Report, *see infra* n.16, which appear to contemplate the management of spectrum shared between licensed and unlicensed operations. Terabeam opposes the shared use of the bands between unlicensed and licensed (or coordinated and registered) services.

of licensing.^{14/} Nevertheless, the Task Force Report particularly stated, with respect to the millimeter wave bands, the Commission should “review *de novo* whether licensing is in fact necessary.”^{15/} The report of the Unlicensed Devices and Experimental Licenses Working Group, on which the Task Force Report appears to rely on this issue, reaches a similar conclusion.^{16/}

An analysis of the Task Force Report, therefore, seemingly supports Terabeam’s recommendation that the FCC not employ the Exclusive Use Model of licensing for the millimeter wave bands. As the Task Force Report indicates, the Exclusive Use Model assumes that there are multiple demands for spectrum, and that licensees should be afforded exclusive use to determine, based on market conditions, the most productive use of the spectrum.^{17/} This model fails, however, as applied to the millimeter wave band, where there simply are not competing demands for spectrum. With the technical parameters proposed by the FCC, and generally endorsed by Terabeam, the millimeter wave bands can only meaningfully be used for point-to-point, limited distance operations. Unlike the bands below 5 GHz,^{18/} which the Task Force Report concludes are the most appropriate for the Exclusive Use Model, the millimeter wave bands cannot support a variety of high- and low-power, fixed and mobile uses. Based on the foregoing, Terabeam strongly opposes the use of geographic area, or Exclusive Use licensing to authorize the millimeter wave bands.

^{14/} Spectrum Policy Task Force, *Nov. 2002 Report*, ET Docket No. 02-135 (rel. Nov. 15, 2002) (“Task Force Report”).

^{15/} *Id.* at 55.

^{16/} Spectrum Policy Task Force, *Report of Unlicensed Devices and Experimental Licenses Working Group* at 14, 17 (rel. Nov. 15, 2002) (“UDELWG Report”).

^{17/} *Id.* at 38-39.

^{18/} *Id.* at 38.

3. **Unlicensed Operations are Inappropriate for the Millimeter Wave Bands**

Just as the Task Force Report does not support the use of the Exclusive Use licensing method to authorize the millimeter wave bands, it also does not support unlicensed operations in the bands (or what the Task Force references as the “Commons Model”). The UDELWG Report is instructive. It discusses the most significant uses of unlicensed devices, all of which are consumer oriented.^{19/} Neither the Task Force Report nor the UDELWG Report offer compelling examples of the successful use of unlicensed technology in carrier or enterprise operations. However, while Terabeam’s millimeter wave band products will be easy to install, they will be designed, at least initially for carriers and enterprise customers. For these users, unlicensed products are not appropriate. Instead, these customers desire the reliability associated with licensed and coordinated use of the spectrum.

Indeed, the Task Force’s description of the Commons Model does not accord with what Terabeam expects to be the use of the millimeter wave bands. The Commons Model contemplates the use of spectrum protocols, which, according to the Task Force Report “promote efficiency through spectrum sharing, typically by requiring commons to operate at low power for a short time in limited areas, which allows multiple users to operate on the same spectrum.”^{20/} This description does not match what is expected to be the use of millimeter wave bands – the continuous and predictable use of the same frequency band in the same place over time. The type of episodic or periodic spectrum use contemplated by baby monitors, keyless entry systems, devices that employ so-called “wireless fidelity” or “Wi-Fi” technology and other current

^{19/} UDELWG Report at 5-6.

^{20/} Task Force Report at 39.

unlicensed operations simply does not accord with the anticipated use of the millimeter wave bands.

The Task Force Report states that the Commons Model is particularly appropriate for use in the bands above 50 GHz.^{21/} It finds that “[i]n these bands, the propagation characteristics of the spectrum preclude many of the applications that are possible in lower bands (*e.g.* mobile service, broadcasting), and instead favor short-distance line-of-sight operation using narrow transmission beams. Thus, these bands are well-suited to accommodate multiple devices operating within a small area without interference.”^{22/} Terabeam agrees that the propagation characteristics described by the Commission preclude a variety of different conflicting uses of the spectrum, which should cause, as noted below, a rejection of the use of the Exclusive Use Model. However, it is precisely because the spectrum will be used in line-of-sight operation that licensing, or at least coordination, of the spectrum is necessary. Two narrow beam systems operating at the same time in the same place, using the same spectrum, will materially degrade the operation of both. Therefore, coordinated use of this spectrum is required.^{23/}

^{21/} *Id.*

^{22/} *Id.*

^{23/} If the Commission determines to authorize the use of the millimeter wave band on an unlicensed basis, it should at least require that entities proposing to use the band register their operations with a third party entity selected by industry or the FCC. As noted below, Terabeam prefers that such third party be responsible for, or involved in, the issuance of authorizations for the millimeter wave bands. If the band administrator contemplated by Terabeam cannot be responsible for, or involved in the issuance of authorizations, then potential users of the band should be required to register their operations with the band administrator. Entities would not be permitted to use the bands without registering, and the band administrator would be required to deny registration in the event that a first-registered entity would suffer harmful interference from a later registered entity.

4. Site Specific Licensing Can be Achieved Without Burdens to the FCC

Instead of employing either the Exclusive Use or Commons Models, the FCC should employ site specific licensing in the millimeter wave bands. The Commission disfavors this approach because it is concerned that a site specific licensing approach will create administrative burdens on it and on applicants.^{24/} Both Terabeam and the WCA believe that there are several alternatives available to the FCC that would significantly reduce that burden. First, while millimeter wave spectrum can generally be used successfully by many entities in a geographic area, the use of the band by one entity can preclude its use by another entity using the same transmission path – thereby requiring coordination among licensees. However, industry standards can be developed that can predict, with little analysis, when a proposed path may cause interference to an existing path. The FCC’s ULS has become increasingly sophisticated and permits the nearly automatic processing of certain types of applications.^{25/} Terabeam therefore supports the WCA’s recommendation that, in the course of this rule making proceeding or otherwise, the FCC develop appropriate technical standards that would predict, using only a limited number of parameters (geographic coordinates, antenna height above ground, antenna orientation, etc.) whether proposed operations would interfere with an already licensed system. Those technical standards would be included in the ULS processing system. Licensees would be required to apply electronically for authorizations and the ULS system would be able to automatically evaluate whether such a proposed link was acceptable, using the industry accepted interference criteria. If the proposed link were acceptable, the ULS would permit the applicant to continue the licensing process and would ultimately authorize the desired link upon receipt of

^{24/} NPRM ¶ 68.

^{25/} Most applications for renewal, for example, are submitted electronically in the ULS, processed without material FCC intervention, and licenses renewed in due course. *See* “FCC Universal Licensing System,” *available at* <http://wireless.fcc.gov/uls/>.

the required application fee and, if necessary, lapse of the thirty (30) day period required by Section 309 of the Act.^{26/} If the proposed link were unacceptable, the ULS would be programmed to notify the applicant of the co-channel station or application that prevented the authorization of its proposed facility.^{27/}

Because the use of spectrum by one entity will generally not preclude the use of the same spectrum by another entity in the same geographic area, there is no reason for entities to secure the use of spectrum before the need for the spectrum arises. Terabeam expects, like the Commission, that the millimeter wave bands will be intensively employed. That intensive employment may lead, under favorable conditions, to the need for an entity to obtain dozens of millimeter wave authorizations in a market, but not hundreds or thousands.

If the Commission does not wish to employ the ULS to evaluate whether applications proposed systems that would likely cause harmful interference to existing or proposed operations, the FCC could use a third party entity or entities to accomplish that purpose. These third party entities would be required to, among other things, certify that their evaluation of applications would be in strict accordance with the industry developed guidelines or FCC rules.

^{26/} Applicants would be required to designate their regulatory status. If licensees proposed the use of a common carrier service, the Commission would be required, pursuant to Section 309 of the Act, to reference the submission of the application on a public notice and wait thirty (30) days before the issuance of a license. For non-carriers, authorizations could be issued immediately upon receipt of the application fee. 47 U.S.C. § 309(b).

^{27/} Terabeam recognizes that in some instances, Federal government facilities would prevent the authorization of proposed facilities. NPRM ¶ 67 (noting that “the 71-76 GHz, 81-86 GHz and 92-95 GHz band are allocated to Federal Government services on a co-primary basis.”) Terabeam recommends that the information necessary to protect the Federal government facilities be included in the FCC’s database so that the ULS system can evaluate whether a proposed system will cause unacceptable interference to a Federal government station. If such harmful interference is predicted, the ULS would not identify the operating parameters of the government system, as it might for privately licensed systems. Instead, the ULS will simply state that the proposed operations are prevented by use of the desired spectrum by Federal government operations.

Applications submitted by such entities that included the appropriate certifications would be granted pursuant to the procedures described above.^{28/}

The Commission stated two concerns regarding the use of a third party to evaluate applications. First, the FCC alleged that even though burdens would be removed from the Commission, there would still be costly burdens on licensees if third parties were involved in the licensing process.^{29/} Terabeam believes that licensees are willing to bear that burden, rather than to be subject to either the secondary market inefficiencies of the geographic licensing or band manager approaches or the uncertainty of using unlicensed spectrum. Second, the Commission states that a third party would be required to function in accordance with the technical licensing criteria codified in the FCC's rules and that any change in criteria would require the initiation of a rule making proceeding.^{30/} Because entities already function effectively within those criteria in

^{28/} The Commission often uses third party entities in the authorization processes. In Parts 90 and 101 of its rules, the Commission contemplates the submission of evidence of frequency coordination with most applications. *See* 47 C.F.R. §§ 90.175, 101.103. The Commission has more generally used third party entities to approve the use of devices under Part 68 of the rules, and has authorized so-called Telecommunications Certification Bodies ("TCBs") to evaluate the use of products subject to the equipment approval process. *See In the Matter of 2000 Biennial Regulatory Review*, CC Docket No. 00-175, Report, 16 FCC Rcd 1207 ¶ 23 (2001) (privatizing the standards development and terminal equipment approval processes); *In the Matter of 2000 Biennial Regulatory Review of Part 68 of the Commission's Rules and Regulations*, CC Docket No. 99-216, Report and Order, 15 FCC Rcd 24944 ¶¶ 31-33 (2000) (requiring industry to establish a committee to develop technical criteria). The FCC has also permitted third parties to issue Maritime Mobile Service Identities ("MMSIs"), which are similar to authorizations for ship stations, in the maritime services. *See In the Matter of Amendment of Part 0 of the Commission's Rules to Delegate Authority to the Wireless Telecommunications Bureau Concerning Procedures for Assigning Domestic Maritime Mobile Service Identities*, Order, 14 FCC Rcd 21517 (1999); "Commission Announces Revision of Procedures for Assigning Maritime Mobile Service Identities," *Public Notice*, 16 FCC Rcd 918 (2001). While most of these options (except for the issuance of authorizations by a third party) would involve the issuance of licenses by the FCC – which the Commission considers burdensome – the use of third parties to evaluate applications will at least remove this perceived burden from the FCC.

^{29/} NPRM ¶ 69.

^{30/} *Id.*

other contexts, there is no reason to believe that those, or other entities, will not be able to function as well within the context of the millimeter wave bands. If there is a requirement for the technical criteria under which third parties evaluate applications to change, Terabeam believes that the delay inherent in such a rule making proceeding is still preferable to the alternative licensing mechanisms or unlicensed operations.

Finally, if the FCC does not wish to use third parties as frequency coordinators, it should permit one or more third party entities – band administrators – to coordinate the use of the millimeter wave bands. As noted above, the FCC has already established mechanisms pursuant to which third parties are permitted to issue authorizations otherwise issued by the FCC.^{31/} The Commission should extend this concept to the millimeter wave bands, by recognizing third party band administrators as entities capable of permitting use of the millimeter wave bands under parameters specified either by the Commission or by an industry group.

D. Technical and Operational Rules

Terabeam generally supports those Commission's proposals regarding the implementation of operational rules that are consistent with its view that the FCC should authorize the use of the millimeter wave bands on either a licensed, site-by-site basis or on an unlicensed, but registered and coordinated basis. Therefore, Terabeam opposes regulations envisioned by a geographic area or band manager licensing approach.^{32/} Terabeam otherwise concurs in the WCA recommended approach to coordination in border areas, license term and

^{31/} See *supra*, n.23.

^{32/} Consequently, Terabeam does not believe it relevant to address the FCC's proposal to issue individual station licenses in instances where a geographic licensing scheme is employed. It also does not address partitioning and disaggregation, concepts relevant only in geographic licensing schemes.

renewal expectancy, construction and coverage requirements and application of Title II of the Communications Act.

With two exceptions, Terabeam also endorses WCA's approach to the technical and operational rules proposed by the FCC, including WCA's recommendations regarding the channelization plan, interference protection criteria, frequency tolerance restrictions on total radiated power and radiofrequency ("RF") safety. Terabeam recommends two further refinements, however, to the WCA's position regarding antenna gain and beamwidth. Based on Terabeam's research, it expects that transmitters in the 70 GHz and 80 GHz bands will be employed for backhaul of mobile communications traffic. Accordingly, the antennas associated with these transmitters will often be located on towers on which mobile communications antennas are also situated. These, often free standing, towers are subject to modest movement caused by wind conditions. Terabeam is concerned that, in wind conditions, the beamwidth specifications proposed in the NPRM and the power restrictions recommended in the WCA comments^{33/} may unnecessarily curtail reliable communications in the millimeter wave band.

The issues of permissible beamwidth and power limits are addressed by the three notes in the table found in WCA's comments.^{34/} Terabeam concurs in the adoption of the first note, which generally authorizes wider beamwidths for antennas with gain of less than 50 dBi. The second note addresses the reduction in power required by the use of wider beamwidth antennas. It provides that antenna gain of less than 50 dBi is permitted with a proportional reduction in maximum authorized transmitter power and provides a formula by which transmitter power must be reduced for lower gain antennas. Terabeam believes that the formula proposed in the second footnote is more restrictive than is required. In particular, Terabeam recommends that the

^{33/} Comments of WCA at 28 (filed Nov. 19, 2002).

^{34/} *Id.*

formula in the second note be amended so that the maximum allowable EIRP (in dBW) for antennas of less than 50 dBi gain should be $EIRP = +55 - 2.5(50 - G)$ dBW, where G is the antenna gain in dBi. Of course, and as WCA recognizes, the FCC's RF safety regulations are more restrictive in certain circumstances, including a typical 12" diameter, 43 dBi antenna, than the formula proposed by Terabeam. In instances where those regulations would mandate lower antenna power than the formula, the regulations would apply.

The third note in the WCA table is designed to set radiation suppression limits for side lobes to antennas. However, the main lobes of antennas with beamwidths of 1° or more will intrude on the initial suppression zones specified in the table. For example, a 2.0° main beam would be only 3 dB suppressed from the centerline and would therefore contravene the restrictions of the third note as currently worded, or would require a strict interpretation of the EIRP reduction formula, requiring an additional 20 dB of transmit power reduction for a typical 2.0° beamwidth, 40 dBi antenna. Instead, Terabeam recommends that the specifications contained in the third note apply only to the sidelobes in the region of 1° to 5° from the centerline from the main beam, and not the main beam itself.^{35/}

^{35/} Furthermore, there appears to be a sign error in the EIRP reduction formula of Note 3, which allows for a variance in the L_1 requirement in exchange for a proportional reduction of transmit power according to the following formula: $EIRP = +55 - 2(L - L_1)$, where L is the variant sidelobe suppression and L_1 is the requirement. There is only a variance when $L < L_1$, so in order to cause a reduction in transmit power, the following formula should be used: $EIRP = +55 - 2(L_1 - L)$.

III. CONCLUSION

Based on the foregoing, Terabeam urges the Commission to adopt regulations as described above and to act in a manner consistent with the recommendations made herein.

Respectfully submitted,

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