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

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

In the Matter of	)	
	)	
Amendment of the Commission's Rules	)	ET Docket No. 96-102
to Provide for Unlicensed NII/SUPERNet	)	RM-8648
Operations in the 5 GHz Frequency Range	)	RM-8653
	)	
	)	
To: The Commission	)	

DOCKET FILE COPY ORIGINAL

COMMENTS

FIXED POINT-TO-POINT COMMUNICATIONS SECTION, NETWORK EQUIPMENT DIVISION OF THE TELECOMMUNICATIONS INDUSTRY ASSOCIATION

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TABLE OF CONTENTS

SUMMARY i

ESTABLISHMENT OF RULES FOR NII/SUPERNet IS IN THE PUBLIC INTEREST PROVIDED CERTAIN REVISIONS ARE MADE 2

THE NII/SUPERNet MUST NOT INCLUDE UNLICENSED 5 GHz BAND POINT-TO-POINT PATHS EXCEEDING 1-2 KILOMETERS IN LENGTH 4

A. Permitting Unlicensed Paths Exceeding 1-2 Kilometers In Length Is Unnecessary 4

B. Longer Range Paths, With Greater Capacity, Are Available In Other Bands 6

C. Protection from Harmful Interference Must Be Documented 7

D. Restricting Unlicensed Point-to-Point Paths to 1-2 Kilometers In Length Is Compatible With HIPERLAN 8

THE PROPOSED TECHNICAL STANDARDS MUST BE ADOPTED 9

CONCLUSION 10

SUMMARY

In the captioned Notice of Proposed Rule Making ("NPRM"), the Commission proposes rules to establish a new category of unlicensed equipment, called NII/SUPERNet devices. These devices would operate in the 5 GHz band.

The Fixed Point-to-Point Communications Section, Network Equipment Division of the Telecommunications Industry Association ("TIA"), generally favors the Commission's proposals set forth in the NPRM. Such devices certainly would serve the public interest.

Certain revisions to the rules proposed in the NPRM nevertheless are necessary. To ensure that the public interest is served, as detailed herein:

- For the 5 GHz band, the Commission must not permit unlicensed point-to-point NII/SUPERNet paths to exceed 1-2 kilometers in length.

- To accommodate inter-community links supporting NII/SUPERNet, the Commission must encourage the use of licensed, longer range fixed point-to-point microwave radio service ("FS") links usable for the NII in the bands at 18 GHz and above because: (i) it would be consistent with the well-established Commission policy that restricts the bands below 11 GHz to relatively short point-to-point paths; (ii) it would exploit available FS spectrum in the higher bands for inter-community links more efficiently by fully utilizing existing equipment and related technologies, which are less expensive and which provide greater capacity with higher speeds than comparable unlicensed equipment; (iii) it would create a technology platform compatible with international systems, such as the European High Performance Radio LAN; and (iv) it would potentially make the 5 GHz band accessible for other technologies, such as mobile-satellite services.

- The Commission must adopt the proposed technical rules, especially the specifications regarding "harmful interference" (proposed Section 15.409) and regarding EIRP and emission limitations (proposed Section 15.407).

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COMMENTS

Pursuant to Section 1.415 of the Commission's Rules,[1] the Fixed Point-to-Point Communications Section, Network Equipment Division of the Telecommunications Industry Association ("TIA"),[2] hereby comments on the above-captioned Notice of Proposed Rule Making ("NPRM").[3] In the NPRM, the Commission proposes amending Part 15 of its rules and making

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[1]47 C.F.R. Section 1.415 (1996).

[2]TIA is the principal industry association representing fixed point-to-point microwave radio service ("FS") manufacturers. TIA members serve, among others, companies, including telephone carriers, utilities, railroads, state and local governments, and cellular carriers, licensed by the Commission to use private and common carrier bands for provision of important and essential telecommunications services. TIA has completed its June 1994 "Telecommunications Systems Bulletin No. 10-F, Interference Criteria for Microwave Systems" ("Bulletin 10-F"), which prescribes standards for implementing the new channel plan for the bands above 3 GHz and for establishing criteria regarding 2 GHz band PCS-to-microwave interference protection. As part of its ongoing standard-setting process, TIA is updating Bulletin 10-F, and Bulletin 10-G is in draft. Furthermore, TIA, along with the National Spectrum Managers Association, was responsible for most of the technical rule proposals recently adopted by the Commission in its consolidation of Parts 21 and 94 into new Part 101. See Reorganization and Revision of Parts 1, 2, 21 and 94 of the Rules to Establish a New Part 101 Governing Terrestrial Microwave Fixed Radio Services, Report and Order, WT Dkt. No. 94-148, 2 Comm. Reg. (P&F) 541 (1996).

[3]The NPRM was published in the Federal Register on May 16, 1996. 61 FR 24749.

available 350 MHz of spectrum at 5.15-5.35 and 5.725-5.825 GHz for use by a new category of unlicensed equipment, called NII/SUPERNet devices.[4]

ESTABLISHMENT OF RULES FOR NII/SUPERNet IS IN THE PUBLIC INTEREST PROVIDED CERTAIN REVISIONS ARE MADE

TIA generally favors the Commission's proposals set forth in the NPRM. Availability of the contemplated unlicensed "short-range, high-speed wireless digital communications"[5] devices certainly would serve the public interest.

Certain revisions to the rules proposed in the NPRM nevertheless are necessary. To ensure that the public interest indeed is served, as detailed herein:

- For the 5 GHz band, the Commission must not permit unlicensed point-to-point NII/SUPERNet paths to exceed 1-2 kilometers in length.

- To accommodate inter-community links supporting NII/SUPERNet, the Commission must encourage the use of licensed, longer range FS links usable for the NII in the bands at 18 GHz and above because: (i) it would be consistent with the well-established Commission policy that restricts the bands below 11 GHz to relatively short point-to-point paths; (ii) it would exploit available FS spectrum in the higher bands for inter-community links more efficiently by fully utilizing existing equipment and related technologies, which are less expensive and which provide greater capacity with higher speeds than comparable unlicensed equipment; (iii) it would create a technology platform compatible with international systems, such as the European High Performance Radio LAN ("HIPERLAN"); and (iv) it would potentially make the 5 GHz band accessible for other technologies, such as mobile-satellite services ("MSS").

- The Commission must adopt the proposed technical rules, especially the specifications regarding "harmful interference" (proposed Section 15.409) and regarding EIRP and emission limitations (proposed Section 15.407).

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[4]NPRM at ¶1.

[5]NPRM at ¶1.

In its comments on the underlying petitions for rulemaking by the Wireless Information Networks Forum ("WINForum") and by Apple Computer, Inc. ("Apple"),[6] TIA supported establishment of the new service, but it also recommended that the Commission adopt similar changes to their proposals:

> TIA fully supports any spectrum reallocation that promotes the development of new technologies and services; that enhances the ability of U.S. telecommunications equipment manufacturers and service providers to compete in international markets; and that protects existing services. The high-speed, high-bandwidth unlicensed radio services proposed by WINForum and by Apple potentially meet these criteria. However, as discussed below, the proposed 5 GHz band reallocations must not be adopted until: (i) restrictions on point-to-point paths are imposed; (ii) appropriate Effective Isotropic Radiated Power ("EIRP") limitations are established; and (iii) necessary band sharing with existing services is demonstrated to be attainable.[7]

An essential component of the proposed NII/SUPERNet infrastructure is the use of unlicensed longer-range, higher powered "community-wide" networks with 10-15 kilometer point-to-point paths. As detailed in its Comments on the WINForum and Apple proposals and in its related October 18, 1995, Statement of Ex Parte Discussion ("Statement"), TIA opposes authorizing such 5 GHz 10-15 kilometer long paths, on an unlicensed basis, as part of the NII/SUPERNet. Instead, unlicensed 5 GHz band NII/SUPERNet point-to-point paths must be limited to 1-2 kilometers in length. Unless these restrictions are imposed, TIA cannot support adoption of the NPRM.

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[6]WINForum's Petition for Rulemaking is RM-8648; Apple's Petition for Rulemaking is RM-8653 ("Apple Petition").

[7]TIA's July 10, 1995, Comments ("TIA Comments") at 2.

THE NII/SUPERNet MUST NOT INCLUDE UNLICENSED 5 GHz BAND POINT-TO-POINT PATHS EXCEEDING 1-2 KILOMETERS IN LENGTH

In its proposal, Apple suggests that the new service would include community-wide paths exceeding 10 kilometers in length:

> [T]he NII Band rules will permit much larger distances for unlicensed operation outdoors. With NII Band devices, it will be possible to communicate at distances on the order of 10 to 15 km or more, depending, of course, on terrain, bandwidth, and other factors.[8]

As detailed below, adoption of this proposal is unjustified and unsupported by the record.

A. Permitting Unlicensed Paths Exceeding 1-2 Kilometers In Length Is Unnecessary

The potential use of unlicensed, point-to-point links, which exceed 1-2 kilometers in length, is not an insignificant issue. Before opening the door to unlicensed paths of this length, the Commission must give serious consideration to issues involving the promotion of existing sound spectrum usage policies in the higher bands; lower cost, large capacity, high speed inter-community links in these higher bands; and compatibility with emerging international telecommunications infrastructure.

Use of short-range, unlicensed point-to-point paths in excess of 1-2 kilometers in the NII/SUPERNet band threatens sound spectrum management:

> Low frequency microwave spectrum is a precious national resource. Applicable FS rules (i.e., current Part 21 and Part 94 rules, as well as proposed Part 101 rules) significantly limit the use of this spectrum for relatively short point-to-point paths. These rules cause short point-to-point paths to use high frequency spectrum. The Commission has provided bands and manufacturers have provided equipment specifically for this application.

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[8]Apple Petition at 18.

* * * * * *

> Given the considerable need of mobile users for low frequency spectrum, the creation of a new low frequency allocation for short-distance, fixed point-to-point service would be totally inappropriate and unnecessary.[9]

Indeed, even the National Telecommunications and Information Administration ("NTIA"), in comments on the WINForum and Apple proposals, raised the same concern:

> Some commenters on the petitions have questioned the practicality and spectrum efficiency of the Apple devices using the 5 GHz band for medium-range point-to-point communications -- i.e., networking that would extend not only within a short range, such as within a building, but also to distances as far as 10 to 15 kilometers away -- and have recommended that other bands above 10 GHz be considered before a commitment is made to a frequency band for wireless devices. NTIA believes that it may be impractical to use the 5 GHz band to support both local area networks and medium-range point-to-point communications. NTIA is also concerned that transmitting data over 10 kilometer distances at high speeds will preclude spectrum sharing among multiple users, including incumbent Federal users.[10]

In the NPRM, the Commission appears to share the TIA and NTIA concerns:

> We are not, however, proposing to accommodate the higher power, longer range communications links sought by the petitioners at this time. We are concerned that permitting such higher power operations would pose unacceptable interference risks to other services, such as fixed satellite service in the 5.10-5.35 GHz band, and would greatly limit the number of unlicensed operations within a local area.[11]

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[9]TIA Comments at 3.

[10]Letter from NTIA to the Commission, dated November 2, 1995, regarding RM-8648 and 8653, Preliminary Technical Review of Spectrum Management Aspects of WINForum and Apple Nonlicensed Networking Devices Proposals, at iv.

[11]NPRM at ¶47.

However, the Commission also finds "merit in the concept of longer range community networks" and it thus seeks comment on implementing such paths.[12]

TIA opposes authorizing unlicensed 5 GHz band point-to-point paths exceeding 1-2 kilometers. A basic Commission policy, that short haul "hops" should be in bands at 18 GHz and above, thereby reserving spectrum below 11 GHz for longer-range hops, would be compromised. "Hops" of up to 10 or 15 kilometers, as is being considered for the newly proposed unlicensed NII/SUPERNet operations, would be an inefficient use of valuable spectrum. For example, the licensed 18 GHz band is perfectly adapted to the 10 kilometer high-speed, high-reliability point-to-point links that might be required for inter-community communications.

B. Longer Range Paths, With Greater Capacity, Are Available In Other Bands

Unlicensed NII/SUPERNet operations, as conceived in RM-8648 and RM-8653, are envisioned as being useful for very short range communications. The inclusion of paths exceeding 1-2 kilometers is inconsistent with the short range local concept that makes unlicensed operations feasible.[13] The power requirements for 10-15 kilometer paths would preclude the local wireless operations from functioning due to harmful interference.[14]

Affordable technology already exists for longer-range FS paths, which could provide inter-community links for NII/SUPERNet. Domestic manufacturers are producing equipment for use

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[12]NPRM at ¶48.

[13]TIA agrees with the Commission's decision, to reject Apple's proposal to establish a new Part 16 for NII/SUPERNet, because it is unnecessary. NPRM at ¶60.

[14]See Attachment A, which was submitted with TIA's Statement on the Apple and WINForum proposals. Consistent with the recommendations set forth herein, in Attachment A, TIA makes three points: (i) use of a common frequency band for local and long distance transmission is undesirable; (ii) high frequencies are best suited for simple point-to-point applications; and (iii) cost-effective technology for these applications already exists.

in the 18 GHz, 23 GHz, 28 GHz, and 38 GHz bands pursuant to Commission policy on using such higher bands for these "hops."

Due to the specific nature of applications and technology used at these frequencies, costs and required installation time are kept at very low levels compared with more traditional microwave systems. In fact, the cost of supplying a millimetric radio link is comparable to the cost of the corresponding unlicensed equipment alternative. Estimates range from less than $20,000-$25,000 per 18 GHz hop to less than $15,000 per hop in the higher bands. In contrast, current unlicensed DS-1 ("T-1") radios typically cost $18,000 per hop (includes two terminals). Moreover, licensed equipment in that price range is capable of operating at twice the capacity as the unlicensed equipment and is available for even higher speed applications.[15] Further, vital short/medium-range inter-community links, using 18 or 23 GHz FS bands, would benefit from complete interference protection.

No justification has been made by Apple or WINForum to duplicate these efforts with new equipment at 5 GHz. Nor have the they demonstrated any valid reason for the Commission to retreat from its policy aimed at efficient use of valuable spectrum.

C. Protection from Harmful Interference Must Be Documented

Antennae designs are an important factor in spectrum allocation decisions. For example, in order to establish FS links that exceed 10 kilometers in length at 5 GHz, a large "physical plant" would be required to achieve the distance and to keep the beam sufficiently narrow to

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[15]The licensed equipment has capacity of up to 8T-1 and can operate at speeds ranging from 45 mb/s to 155 mb/s, which is ideal to support inter-community links for NII/SUPERNet. In contrast, current unlicensed equipment only has capacity up to 4T-1 and the proposed NII/SUPERNet system would operate at speeds of only up to 20-25 mb/s, which is more appropriate for 1-2 kilometer local paths.

avoid all other unlicensed operations. At a minimum, a six (6) foot dish would be required at 5 GHz -- certainly unwieldy and "overkill" for an unlicensed wireless operation. Comparatively, only a two (2) foot or smaller dish or less would be required at the higher bands. The two (2) foot dishes already are commonly available.

TIA's primary problem with the proposal is the use of a single unlicensed frequency band for both short and long distance operation. A 5-10 kilometer nondiversity path, with marginal path clearance, will require significantly more transmit power than will a transmitter intended for short distance use. The use of relatively high power for long distance paths significantly increases the risk of the long distance transmitters interfering with simple, low cost, short distance receivers.

D. Restricting Unlicensed Point-to-Point Paths to 1-2 Kilometers In Length Is Compatible With HIPERLAN

An architecture similar to that contemplated for NII/SUPERNet is being established in Europe. The HIPERLAN standard is being developed by the European Telecommunications Standards Institute.[16]

Both WINForum and Apple claim that NII/SUPERNet and HIPERLAN are compatible.[17] This claim is unjustified. The maximum length for a HIPERLAN "hop" is 1 kilometer, and the typical length is no more than a few hundred meters. Thus, if the NII/SUPERNet indeed is to be compatible with HIPERLAN, TIA's proposed limit of unlicensed 1-2 kilometer hops must be adopted.

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[16]NPRM at ¶3.

[17]NPRM at ¶¶3, 17.

Furthermore, WINForum and Apple assert that "the similarities of their proposals to the HIPERLAN standard suggest that unlicensed wireless operations can successfully share spectrum with MSS feeder links at 5.15-5.25 GHz."[18] Again, WINForum and Apple are wrong. Given the low EIRP needed to operate 1 kilometer long paths, there should be no problem accommodating both HIPERLAN systems and MSS feeder links on the same band. However, if the Commission permits NII/SUPERNet to include unlicensed longer range paths, the EIRP would be higher and the potential for interference with MSS feeder links would increase significantly. Consequently, the Commission's conclusion, that sharing is feasible between NII/SUPERNet and MSS feeder limits, is unjustified.[19]

THE PROPOSED TECHNICAL STANDARDS MUST BE ADOPTED

In the NPRM, the Commission proposes providing "maximum technical flexibility in the design and operation" of NII/SUPERNet unlicensed devices.[20] However, the Commission also is mindful of the need to protect other services from harmful interference:

> At the same time the rules must ensure that these devices do not cause harmful interference to the incumbent and proposed operations in these or adjacent bands. We agree with the petitioners that minimal standards would provide opportunity for the greatest variety of unlicensed devices that may use these bands and would enable the maximum flexibility in the types of services that may be provided. We are proposing . . . the minimal technical regulations we believe are necessary to accomplish these goals. These rules specify power limits, out-of-band emission limits, and a basic "listen-before-talk" protocol standard. We are encouraging the industry to develop any further protocol standards or etiquette it believes necessary.[21]

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[18]NPRM at ¶17.

[19]NPRM at ¶¶35, 54.

[20]NPRM at ¶46.

[21]NPRM at ¶46 (footnote omitted).

TIA agrees with this approach. The Commission appropriately proposes specifications for: (i) what constitutes "harmful interference" and what must be done in response with respect to the NII/SUPERNet devices;[22] and (ii) general technical requirements for peak EIRP[23] and emission limitations.[24]

Transmissions at low microwave frequencies will affect many users. Their operations must be protected from harmful interference. The best method to attain this protection is to limit EIRP (to prevent overload to nearby users and to limit long-distance transmission) and by limiting out-of-band spectral emissions (to avoid adjacent channel interference). Thus, TIA urges the Commission to adopt proposed Sections 15.407 and 15.409.

CONCLUSION

The public interest mandates that the Commission adopt rules for unlicensed NII/SUPERNet devices. It is well-established in the record of this rulemaking that educational institutions, health care providers, libraries, businesses and other users will benefit from availability of these devices.

Before these rules are adopted, however, the Commission must be careful to include necessary restrictions on how point-to-point links will be used to support NII/SUPERNet. First, for the 5 GHz band, unlicensed point-to-point paths must not exceed 1-2 kilometers in length. Second, for longer range inter-community links, licensed FS point-to-point paths in the 18, 23, 28, and 38 GHz bands, should be used.

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[22]Proposed Section 15.409(a).

[23]Proposed Section 15.407(a).

[24]Proposed Section 15.407(b).

These restrictions would ensure that the proposed NII/SUPERNet truly serves the public interest. Compatibility with European and other emerging international telecommunications systems would be enhanced. Existing equipment, which costs less, and carries more traffic at higher speeds, would be available for essential inter-community links.

Respectfully submitted,

FIXED POINT-TO-POINT COMMUNICATIONS SECTION, NETWORK EQUIPMENT DIVISION OF THE TELECOMMUNICATIONS INDUSTRY ASSOCIATION

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July 12, 1996

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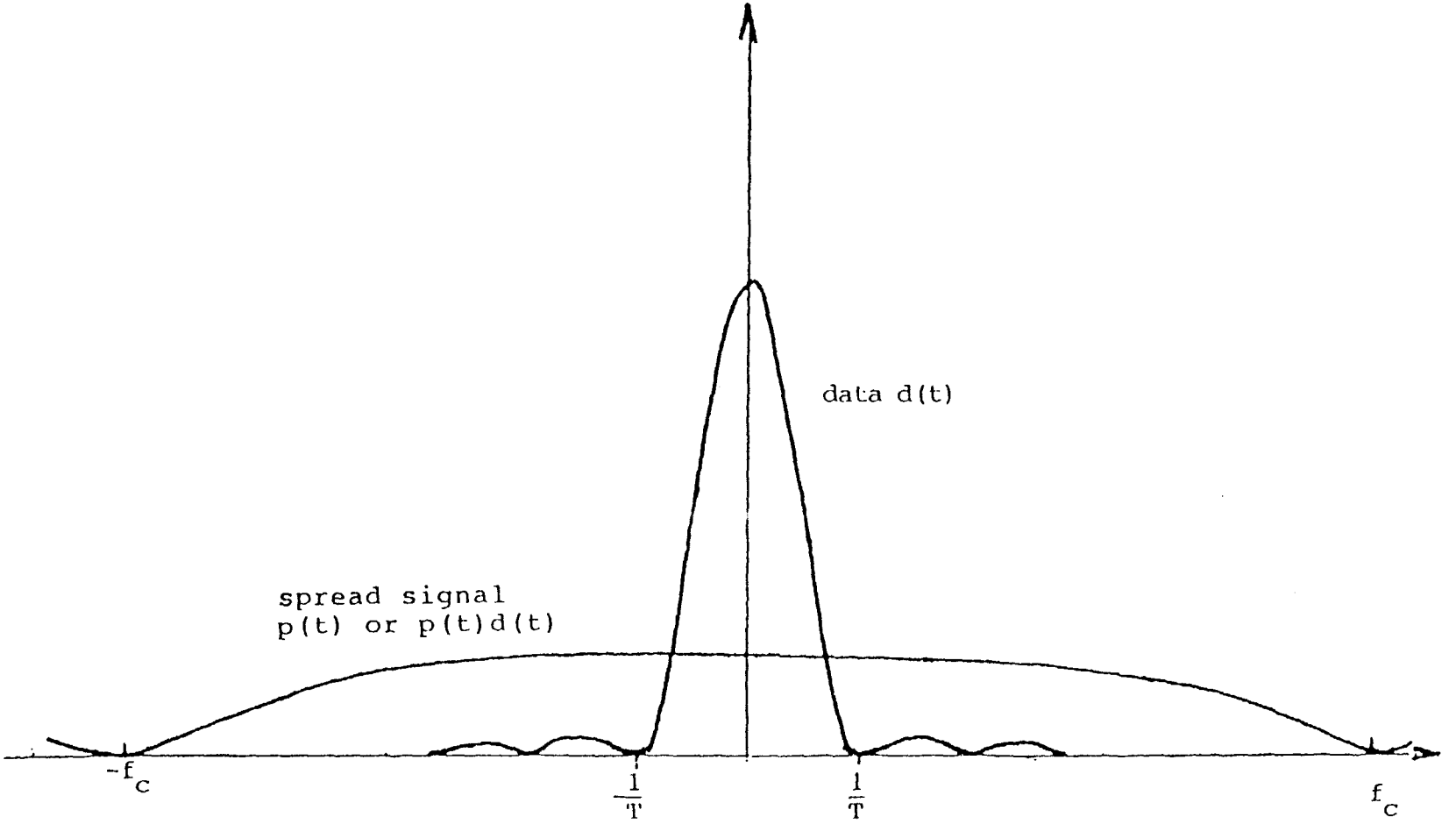
ATTACHMENT A

ATTACHMENT A

Unlicensed Radio Systems



Power spectrum of data and of spread signal.

- Concerns regarding the WINForum Proposal
  - Use of Common Frequency Band for Local and Long Distance Transmission is Undesirable
  - High Frequencies are Best for Simple Point-to-Point Applications
  - Cost Effective Technology Already Exists

- Use of Common Frequency Band for Local and Long Distance Transmission is Undesirable
  - When Compared to Local Operation (0.2 miles), Long Point-to-Point Operation (10 miles) Will Require Significantly More Power
    - ◊ Path has more loss (34 dB)
    - ◊ Path needs more fade margin (20 dB)
    - ◊ Receive antenna gain helps (-24 dB)
    - ◊ Net differential (30 dB)
  - One Point-to-Point User Would Look Like Many Local Users (30 = 10 log (1000))
  - Point-to-Point Will Foreclose Local Use of Band

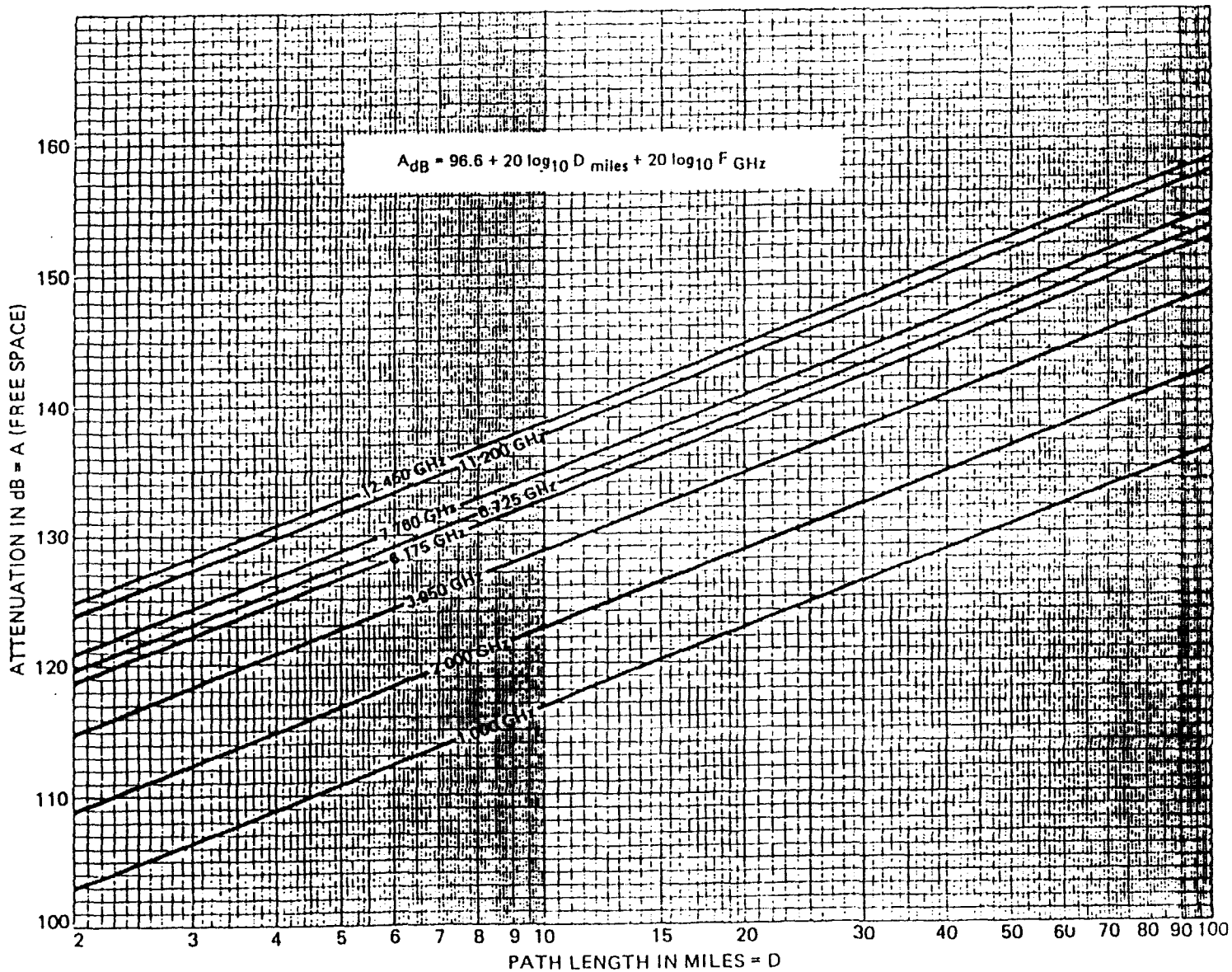


Figure 13. Free Space Attenuation Between Isotropic Antennas

White, R. F., Engineering Considerations for Microwave Communications Systems, San Carlos: Lenkurt Electric, 1970, pg. 36.

- High Frequency Bands are Best for Simple Point-to-Point Applications
  - High Frequency Bands Simplify Frequency Reuse
  - High Frequency Bands Have the Necessary Long Distance Transmission Capability

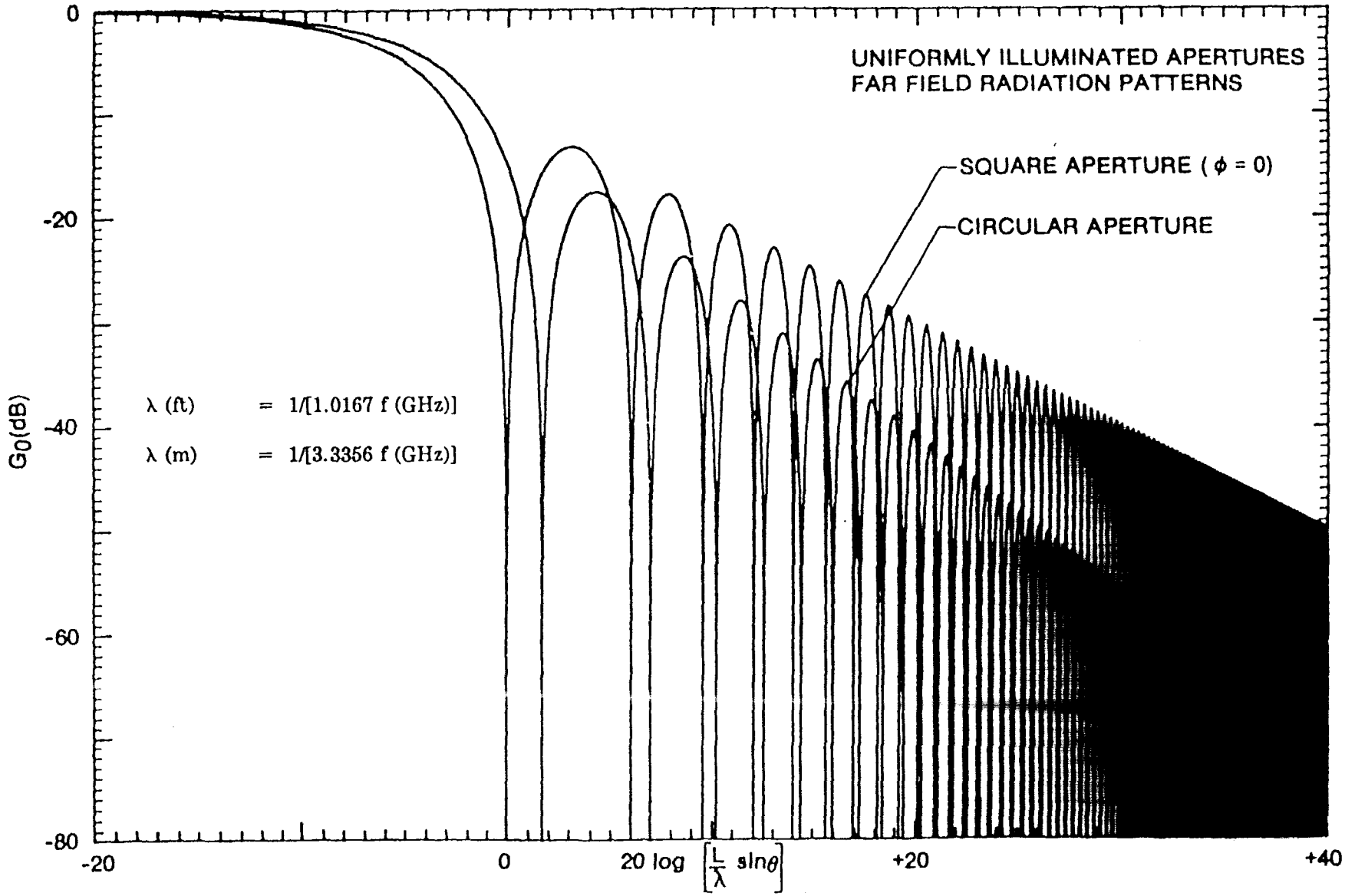
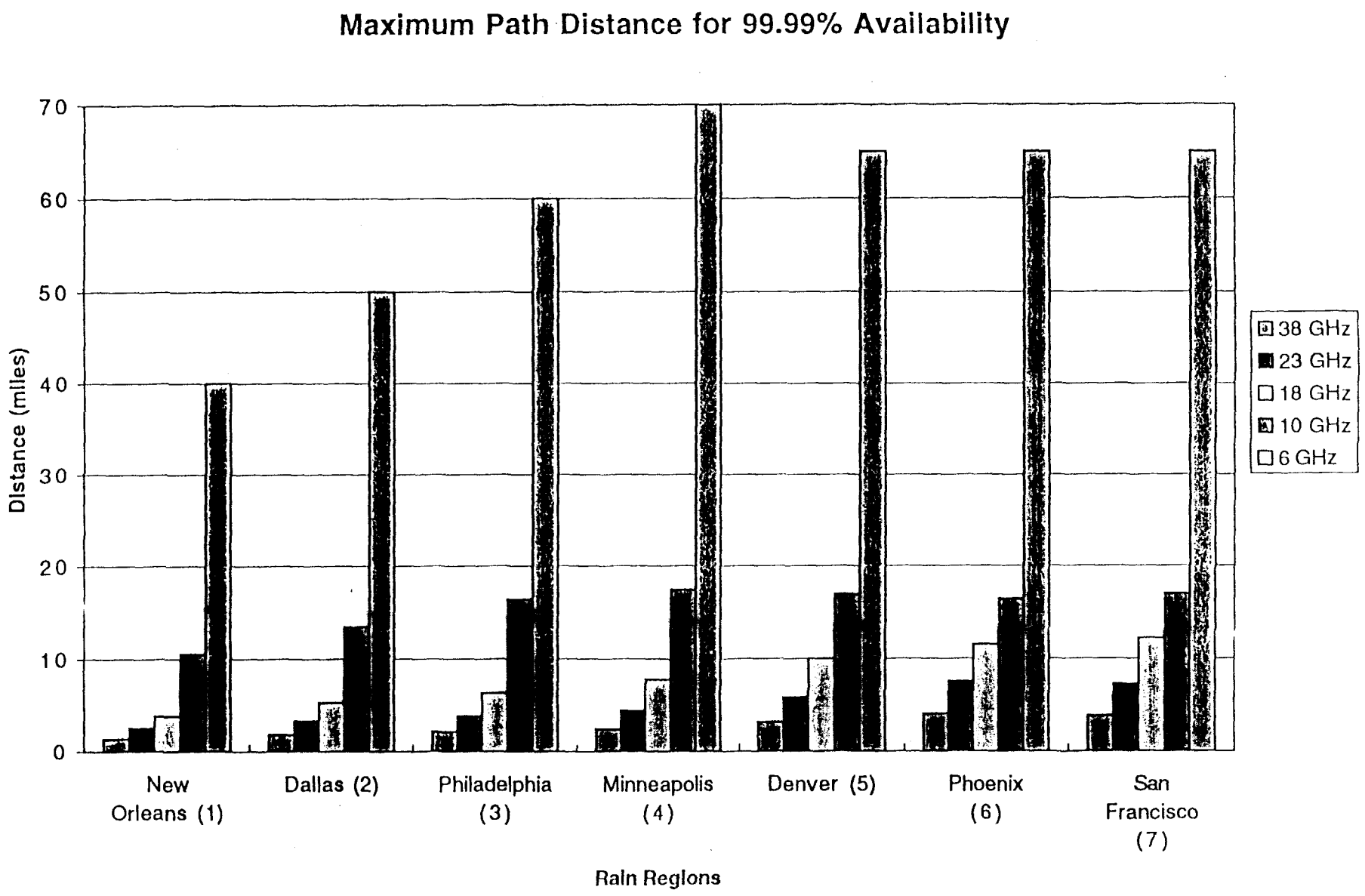
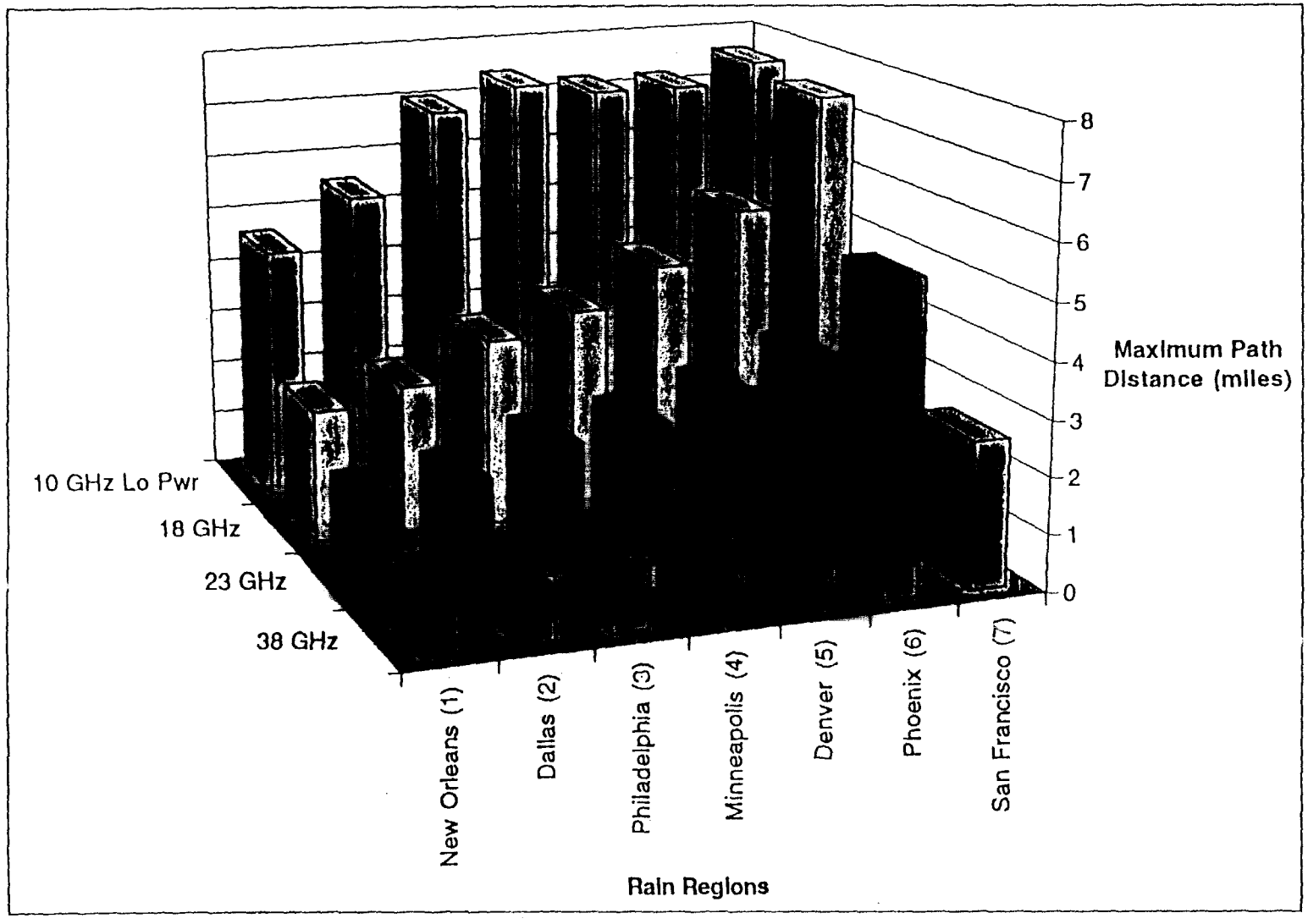


FIG. 9-2 Circular or square reflector radiation pattern.

Kizer, G. M., Microwave Communication, Ames: Iowa State University Press, 1990, Pg. 319.


Maximum Path Distance for 99.99% Availability
Distance (miles)
70
60
50
40
30
20
10
0
New Orleans (1)
Dallas (2)
Philadelphia (3)
Minneapolis (4)
Denver (5)
Phoenix (6)
San Francisco (7)
Rain Regions
38 GHz
23 GHz
18 GHz
10 GHz
6 GHz

MICROWAVE
How far can you go?



- Cost Effective Technology Already Exists
  - Current Nonstandby Point-to-Point Products Cost $7,000 - $10,000 Per Terminal Including Small Antennas
  - Similar Price to Comparable Unlicensed Radios