WILLKIE FARR & GALLAGHER LLP

1875 K Street, NW
Washington, DC 20006

Tel: 202 303 1000
Fax: 202 303 2000

April 4, 2007 ***Ex Parte Notice***

Marlene H. Dortch
Office of the Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: In the Matter of the Establishment of Policies and Service Rules for the Broadcasting-Satellite Service at the 17.3-17.7 GHz Frequency Band and at the 17.7-17.8 GHz Frequency Band Internationally, and at the 24.75-25.25 GHz Frequency Band for Fixed Satellite Services Providing Feeder Links to the Broadcasting-Satellite Service and for the Satellite Services Operating Bi-directionally in the 17.3-17.8 GHz Frequency Band, IB Docket No. 06-123

Dear Ms. Dortch:

On April 3, 2007, Joseph M. Sandri Jr., FiberTower Corporation's ("FiberTower") senior vice president for regulatory and government affairs, Dr. William Rummler, technical consultant to FiberTower, Philip Verveer and the undersigned, counsel for FiberTower, met with Robert Nelson, Chip Fleming, Diane Garfield, Andrea Kelly, Paul Noone, and Steven Spaeth to discuss certain technical issues related to the use of 17/24 GHz frequencies by DBS licensees and the potential for interference to 24 GHz terrestrial facilities. Attached hereto are Dr. Rummler's preliminary technical recommendations and other materials summarizing the substance of the discussion.

Should you have any questions regarding this matter, please do not hesitate to contact the undersigned.

Respectfully submitted,

/s/

McLean Sieverding
Counsel for FiberTower Corporation

cc: Robert Nelson,
Chip Fleming,
Diane Garfield,

Andrea Kelly,
Paul Noone, and
Steven Spaeth

FIBERTOWER CORPORATION

FiberTower supports prompt commencement of the 17/24 GHz Broadcasting Satellite Service ("BSS") and continues to seek ways to work with the Commission and BSS operators to develop technical requirements for successful inter-service operations and sharing in the 24 GHz band.

However, the significant potential for harmful interference from BSS feeder-link stations to existing FS operators in the 24 GHz band is a serious threat that must be addressed by the Commission prior to commencement of the BSS.

One efficient and balanced approach to alleviating the interference impediments to coexistence in the 24 GHz band would be to establish an exclusion zone of 100 miles around the boundaries of 24 GHz fixed service wide-area licenses. This pragmatic solution is ideal for a number of reasons, including, among others:

- **Greatly Reduces Need for Comprehensive Band Sharing Criteria:** Should the Commission allow BSS feeder links in FS-licensed areas, numerous significant technical unknowns would need to be fully explored and vetted by the providers of both services, which would be costly and time consuming. Geographic separation allows for prompt commencement of the BSS until comprehensive sharing criteria are developed to ensure a predicable and stable interference environment, should such criteria become necessary.

- **Limited BSS Feeder Links Minimizes Burden:** The number of BSS feeder links are expected to be very limited (*see, e.g.*, DirecTV Comments at 29; SES Americom Comments at 23). Further, considering eighty to ninety percent of the U.S. geography is unlicensed for terrestrial FS operations, requiring, initially, that BSS licensees locate feeder-link earth stations well outside of FS-licensed areas is a minimal burden.

- **Preserves Benefits of Wide-Area Licenses:** Geographic separation preserves an important benefit of the area-wide license concept, which permits providers to continuously optimize their networks in response to changes in technology and demand. This approach would substantially limit costly and time consuming coordination procedures that would be required when a provider's service footprint changes, which predictably it often will.

- **Protects Investment by Incumbents:** Geographic separation is consistent with the Commission's policy of limiting the disruption faced by existing licensees when bands become shared. This would avoid diminishing the considerable investment in facilities, customer contracting, and deployment planning that incumbent FS providers have already made.

An alternative or complementary approach includes locating BSS feeder links closer to FS-licensed area boundaries if the PFD limit in Section 101.509 of the Commission's Rules is modified from -114 dBW/m2/MHz to -142 dBW/m2/MHz.

- **Straight-Forward Technical Solution:** This approach has the advantage that it can be easily applied and implemented consistent with the Commission's Rules. Thus, it could facilitate the rapid introduction of the BSS into the 17/24 GHz bands while providing adequate protection to the existing and future FS systems in the 24 GHz band.

Attachment 1 to FiberTower's Reply Comments

A Review of Potential BSS Satellite Uplinks At 24 GHz and Technical Recommendations For Co-existence With Existing Wide-Area Licensed Fixed Service Operations

By Dr. William Rummler, November 14, 2006

This study provides an alternative approach to Fiber Tower's previous view of the need for a 100 mile separation between satellite earth stations transmitting in the 24 GHz fixed service band and the boundaries of fixed service 24 GHz band licensed areas. The study provides a calculation for a pfd limit required to protect fixed service receivers. This study is based on projections of current art receiver front end design for fixed service receiving equipment and involves computation of the interference power at the victim receiver input which will raise its threshold by 1 dB.[1] The resulting separation distances are more responsive to the emissions toward the FS service area and are comparable to the 100 mile distances in some typical cases.

The permissible power flux density at the boundary of the fixed service license area as determined below is –142 dBW/m^2/MHz. It should be noted that calculations leading to this pfd are not based on the largest antenna size that could be used at 24 GHz and do not include exposure from more than one earth station interfering source, both of which, if included, would cause the allowable pfd to decrease to a more stringent level. The multiple exposure issue deserves further study as more information becomes available regarding BSS system deployment. In addition, FiberTower believes all calculations must be made using maximum earth station transmitter power, since a lack of path loss correlation may be expected on the earth station primary and interference paths.

Either the 100-mile minimum distance separation criterion suggested in FiberTower's comment filing in this proceeding, or the use of a -142 dBW/m^2/MHz power flux-density limit at the FS service area boundary, would allow rapid near-term deployment of BSS systems. In the longer term, for development of a computational process that would facilitate closer siting of earth stations to licensed FS boundaries, FiberTower believes examination and adaptation of the considerable body of industry-developed work on calculation of terrestrial microwave interference would be productive.[2] Additionally, this instant study shows that 47 CFR Section 101.509 requires substantial revision. Section 101.509 includes the Commission's recommendation that coordination between terrestrial systems in this band licensed to operate in adjacent service areas is not necessary if the PFD at the boundary of the relevant adjacent area is lower than -114 dBW/m^2 in any one MHz. The instant study reveals that the PFD at the boundary should be no greater than -142 dBW/m^2 in any one MHz.

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[1] One dB degradation of the receiver noise threshold is a criterion long recognized by industry and supported by TIA TSB 10, which is referenced in 47CFR Section 101.105.

[2] See the National Spectrum Managers Association (NSMA) Recommendations, developed after considerable study by many FS and satellite industry participants; available at www.nsma.org.

Consideration of PFD Limits and Received Interference Power

1. The Section 101.509(c) limit of -114 dBW/m^2/MHz is too high

Other commenters have cited Section 101.509(c) as an appropriate reference. The origin of the numbers and the means of implementing them as a criterion are not at all clear. The following paragraphs consider the problems of implementing this criterion and provide a path forward. A receive antenna gain of 45 dBi as characteristic of the FS systems to be protected is used. With such an antenna near the boundary of the licensed area that is being protected by a pfd limit of -114 dBW/m^2/MHz, the resulting interference power at the receiver input would be -118 dBW/MHz. (pfd = -114 dBW/m^2 in any 1 MHz band and G_R = 45 dBi, P_R = -118 dBW/MHz; see Annex A) This is to be compared to the noise floor of -140 dBW/MHz for a receiver with a 4 dB noise figure. An acceptable level of interference into such a receiver is 6 dB below this or -146 dBW/MHz. Thus the level of interference power reaching the receiver would exceed an acceptable level by 28 dB if there were no other considerations.

2. Discussion of how pfd limits have previously been used

In the case of pfd limits on space-to-earth emissions from satellites, conformance with pfd limits is based on the determination of the pfd under free-space propagation conditions in the absence of atmospheric attenuation. One might expect the pfd due to emissions from an earth station to be determined on the same basis, but conformance with the pfd limit on this basis would produce an acceptable level of interference only if the earth station was separated from the boundary of the FS service area by a large enough distance. For a station on the surface of the earth the specific attenuation due to atmospheric losses under standard conditions is about 0.19 dB/km. Hence if the earth station is more than 147 km from the boundary of the FS service area, the atmospheric attenuation would reduce the interference to an acceptable level. (A slightly smaller value of specific attenuation, the value for the month in which it is expected to have its lowest value, would be more appropriate.)

3. Scenarios producing a level of -114 dBW/m^2/MHz

The approach described in the preceding paragraph may fail to protect the FS in many cases where the e.i.r.p. toward the horizon from a feeder link earth station in the 24 GHz band is low. For example, the EchoStar comments, page 20 of the Technical Annex, mention an e.i.r.p. toward the horizon of 3.4 dBW/MHz. In this case the spreading loss would provide a -114 dBW/m^2/MHz pfd in the absence of atmospheric attenuation at a distance of 7.7 km. Since the atmospheric loss would provide only about 1.5 dB of attenuation, operation of such an earth station would exceed an acceptable level by 26.5 dB (28 – 1.5). One proposal to avoid this problem would be to impose the 28 dB tightening to the criterion and allow the specific attenuation for atmospheric loss to be included in determining whether the pfd requirement is met.

4. Preliminary Recommendation

Thus, the pfd criterion specified in 101.509(c) should be changed to -142 dBW/m^2 in any 1 MHz band and the earth station conformance with this pfd would be determined as follows. The pfd at the boundary of the FS service area would be determined by applying the spreading loss for the distance of the earth station from the boundary to the e.i.r.p. of the earth station toward the horizon on the azimuth toward the boundary. When transmit power control is used, the e.i.r.p. to be used in this calculation is the maximum value.

This approach has the advantage that it can be easily applied and could be implemented in Section 101.509 of the FCC Rules. Thus, it could facilitate the rapid introduction of the BSS services into the 17/24 GHz bands while providing adequate protection to the existing and future FS systems in the 24 GHz band. While it may be possible to develop procedures that would allow feeder link earth stations to be located closer to FS service areas than either of the methods proposed by Fiber Tower, these would best be developed in an industry group with participation of all interested parties. This work could be undertaken by NSMA or by a joint group formed for the purpose in TIA. In either case this would be a lengthy process that, without the application of the proposed minimum distance criterion or maximum pfd limits, could delay the introduction of BSS services in the 17/24 GHz bands.

Annex A: PFD and Received Power Equations

The following equations were used in developing the technical annex.

The formula for determining received power specral density is given as

$$P_R = P_T + G_T - L_{bf} + G_R \qquad (1)$$

where

P_R is the received power specral-density (dBW/MHz);

P_T is the transmitted power specral-density (dBW/MHz);

G_T is the maximum gain of the transmit antenna (dBi);

G_R is the maximum gain of the receive antenna (dBi);

L_{bf} is the free-space basic transmission loss (dB).

With

$$\text{e.i.r.p.} = P_T + G_T$$

$L_{bf} = 20\log(4\pi d / \lambda)$ with d and λ in same units, meters in this analysis,

Equation 1 may be rewritten as

$$P_R = \text{e.i.r.p.} - 10\log(4\pi d^2) - 10\log(4\pi f^2 / c^2) + G_R \qquad (2)$$

Since the spreading loss is defined as $10\log(4\pi d^2)$, Equation 2 may be rewritten as

$$P_R = \text{pfd} - 10\log(400\pi f_{Ghz}^2 / 9) + G_R$$

Or with f = 24 GHz:

$$P_R = pfd - 49.05 + G_R$$

14 Lefferts Court
Middletown, NJ 07748
Phone: 732-671-8883
Fax: 732-671-8883
Email: wrummler@att.net

William D. Rummler

Education:

B.S. in E.E.	Drexel University	1959
S. M. in E.E.	M. I. T.	1960
E.E.	M. I. T.	1961
Sc. D.	M. I. T.	1963

Professional & Honorary Societies & Awards:

Board of Directors of National Spectrum Managers Association (NSMA) 1994 - 99.

Fellow of the I.E.E.E since 1989.

U.S. Delegate to ITU-R (originally CCIR) Study Group 9 since 1984.

International Chairman of ITU-R Working Party 4-9S: Frequency Sharing between the Fixed Service and the Fixed Satellite Service since January 1997

U.S. Chairman of ITU-R Study Group 9: Fixed Service since June 1997

I.E.E.E. Communication Society: Past chairman of the Radio Communications Committee; organizer and chairman of numerous sessions at ICC and GLOBECOM conferences.

Member of Sigma Xi, Eta Kappa Nu, and Phi Kappa Phi.

At M I.T. held a Whitney and a Melpar Inc. Fellowship each for one academic year.

Experience Summary:

Most recently have been participating in ITU-R and U.S domestic standards activities as an independent consultant on issues related to the fixed service and sharing with satellite services. In addition to chairing ITU-R groups as noted above, was the primary U.S. technical contributor to ITU-R TG 1/6, which addressed the determination of coordination area around an Earth station. Participation included chairing and coordinating the work of the editorial sub-group that developed the TG output text, Recommendation ITU-R SM.1448, the source text for Appendix S7 (WRC-2000) of the Radio Regulations.

Began working at Bell Telephone Laboratories in 1963 as a Member of Technical Staff in the Radar Research Department. Subsequently managed and contributed to the feasibility studies of single-sideband microwave radio, underground location systems and automated main distribution frames. For several years served as consultant in the introduction of new interconnection technologies. In 1977 became involved with the performance of digital microwave line-of-sight radio systems originally in BTL and later in organizations directly descended. Subsequently became concerned with the effects on performance of the interference arising from the shared use of the radio spectrum.

While at Drexel worked as a cooperative student at Johnsville Naval Air Development Center, Johnsville, PA. While at M.I.T. worked for two years as a Research Assistant in the M.I.T. Research Laboratory of Electronics, Cambridge, MA. During the summer of 1961, worked at the Applied Science Division of Melpar Inc. in Watertown, MA.

Experience Chronology:

1998 to present Independent Consultant
Continued participation in ITU-R and U.S. Domestic Standards activities related to the fixed service and sharing with other services.

1989 to 1998 AT&T Principal Technical Staff Member
Continued responsibility for formulating and developing radio engineering design and frequency coordination tools for internal AT&T use. Coordinated activities within AT&T as part of the technical interface between AT&T and NSMA. Provided key technical contributions to the Telecommunications Industry Association (TIA) work in TR 14.11 to facilitate Fixed Service sharing with Personal Communications Services (PCS). Have assumed a position of technical leadership for the Fixed Service (FS) in interactions with the Mobile Satellite Service (MSS) in TIA TR34.2/TR14.11, the committee developing sharing criteria to be used in the U.S. Conceived the Fractional Degradation in Performance (FDP) approach as a criterion for sharing between the FS and MSS and contributed to the establishment of this methodology as an international standard by participating in various ITU-R groups (TG 12/4, TG 2/2, WP 9D, WP 9A, WP 4-9S, CPM-95). Coordinated U.S. work in ITU-R TG 12/3 on revising the (RR Appendix S7 (28)) methods for determining the coordination area of Earth stations. In January 1997 accepted the international chairmanship of ITU-R Working Party 4-9S, which deals with issues of frequency coordination and sharing between the Fixed Service and the Fixed Satellite Service.

1977 - 1989 AT&T Bell Laboratories Distinguished Member of Technical Staff
Developed the statistical model of the line-of-sight microwave radio channel in the presence of multipath fading and developed and verified the methods for applying it to the prediction of the performance of the first high-capacity digital radio systems. From propagation measurements made over several years extended the applicability of this model to include the effects of noise and interference and to account for the use of diversity operation. Used this work to develop the basis for the AT&T route engineering tools used for multipath outage predictions.
Developed improved techniques for modeling extreme rainfall rate distributions as well as developing the methodology for using these for predicting the occurrences of outages of microwave radio systems from extreme rain fall events. Had overall responsibility for providing route engineering design tools for AT&T.

1973 - 1976 Bell Telephone Laboratories Member of Technical Staff
Interconnection Technology Studies Department. Modeling and analysis in support of the development of CAD tools for the routing of wiring on multilayer printed wiring boards. Development of design guidelines and cost models to facilitate the introduction of multilayer wiring technology into AT&T equipment designs. Studies of manufacturing processes and cost accounting. Analysis and modeling of switch configurations and the formulation of guidelines for the engineering of plug cross-connect bays used to provide special services.

1971 - 1973 Bell Telephone Laboratories Supervisor
Telephone Outside-Plant Studies. Responsible for studies of the feasibility of using remote sensing devices to locate underground facilities. Responsible for a feasibility study of an approach to designing an automated main distributing frame.

1970 - 1971 Bell Telephone Laboratories Supervisor
Single-Sideband Studies. Responsible for one of the groups performing a study of using single-sideband modulation on line-of-sight paths for long-haul communications in the Bell System Network. Responsible for determining the effects of nonlinearities and the receiver requirements to avoid them. Responsible for modeling the effects of multipath propagation and analyzing the capabilities of alternative equalization strategies.

1963 - 1970 Bell Telephone Laboratories Member of Technical Staff
Radar Research Department. Participated in numerous classified studies of Ballistic Missle Defense Systems. Made significant unclassified contributions in the areas of radar signal design, signal processing, target identification and tracking, and parameter estimation.

Publications: List available on request.