September 30, 2003

Filed Electronically

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

Re: Interference Calculation and Coordination in the 70/80 GHz Band
(WT Docket No. 02-146)

Dear Ms. Dortch

The Above 60 GHz Committee of the Wireless Communications Association is pleased to submit for the record three additional proposals for technical rules governing terrestrial fixed operations in the 70/80 GHz band. These three proposals enjoy the support of virtually every commercial entity that has expressed any interest in the deployment of 70/80 GHz radios, including BridgeWave, Ceragon, Cisco Systems, Comsearch, Endwave, Harris Corporation, LOEA Communications, Stratex Networks, and Terabeam. The Above 60 GHz Committee urges the Commission to adopt these proposals without delay so that the 70/80 GHz frequencies can be employed to bring the public low-cost, fiber-equivalent wireless broadband connections in the very near future.

The Committee's members have been extremely supportive of the Commission's 70/80 GHz proposals from the beginning, and even the first round of comments filed in this proceeding evidenced a remarkable level of agreement about how best to harness the potential of the upper millimeter wave band. In Joint Reply Comments filed February 3, 2003, six members of the Above 60 GHz Committee proposed specific regulatory text on a number of technical requirements that should be incorporated into the service rules for terrestrial operations in the 70/80 GHz band. However, the Joint Reply Comments did not cover some important topics, and not all of the topics covered in the Joint Reply Comments showed unanimous support of the signatories. Technical discussions have therefore continued, in the hope of formulating technical service rules that can optimize the 70/80 GHz band for fiber-equivalent wireless broadband connections without unduly constraining the ability of manufacturers and service providers to innovate.

As a result of the additional technical work that has been undertaken, the Above 60 GHz Committee today proposes regulatory text to resolve three outstanding issues: (1) modifications to 47 C.F.R. § 101.105 to adapt the interference protection criteria in that section to 70/80 GHz operations; (2) modest tightening of the horizontal accuracy with which geographic coordinates must be specified; and (3) modification of 47 C.F.R. § 101.113 in order to require 70/80 GHz radios to use Automatic Transmitter Power Control ("ATPC") and operate within limits based on C/N ratios rather than power flux-densities. These proposals are all based on computer simulations which can be made available upon request.

Interference Protection Criteria in Section 101.105

There has long been widespread agreement that section 101.105 of the Commission's rules was basically appropriate for the 70/80 GHz band, but that the specific interference protection criteria necessary in these bands would be different from those that apply in lower-frequency microwave bands, due to the very different RF propagation effects. Furthermore, in February when the Joint Reply Comments were submitted, members of the Above 60 GHz Committee did not yet agree unanimously whether 70/80 GHz radios should be required to use digital modulation. Some companies favored such a rule in order to minimize both inter- and intra-service interference. Other companies believed that analog applications might be appropriate in certain circumstances, particularly in the early development of these bands. A lack of unanimity on this point made revision of the interference protection criteria difficult.

The Above 60 GHz Committee is now prepared to advance specific amendments to section 101.105 in order to resolve these issues. The proposals reflect the fact that rain fading will be highly correlated in these frequencies; *i.e.,* both the carrier and the interference will fade together during precipitation. The analog/digital issue is compromised by permitting analog deployments, but setting the interference protection criteria in such a way as to provide only partial protection for them. Specifically, while analog modulation typically requires 55 dB C/I or greater, the Committee proposes not to protect C/I objectives in excess of 36 dB in the 70/80 GHz bands. (The difference between 55 dB and 36 dB reflects the expectation of filtering on the analog receiver relative to wideband digital modulation.) This will guarantee that early deployment of analog systems does not preclude the later deployment of digital systems on the same rooftop. Based on these considerations, the Above 60 GHz Committee proposes that section 101.105 be amended by adding a new subparagraph (a)(6) and revising subparagraph (c)(2)(ii) to read as follows:

1. Section 101.105 is amended by adding a new subparagraph (a)(6) and revising subparagraph (c)(2)(ii) to read as follows:

§ 101.105 Transmitter power limitations

(a) * * *

*** * * * ***

(6) *71-76 GHz and 81-86 GHz band.* In these bands the interference analysis shall be conducted on a full-band basis (71-76 or 81-86 GHz). Thus for comparison to the following criteria, the carrier-to-interference ratio (C/I) shall be calculated as the ratio of the total carrier power to the total interference power in the 71-76 GHz or 81-86 GHz band. C/I objectives in excess of 36 dB shall not be protected in these bands.

(i) For receivers employing digital modulation: based upon manufacturer data and following TSB 10 or other generally acceptable good engineering practice, for each potential case of interference a threshold-to-interference ratio (T/I) shall be determined that would cause 1.0 dB of degradation to the static threshold of the protected receiver. For the range of carrier power levels (C) between the clear-air (unfaded) value and the fully-faded static threshold value, in no case shall interference cause C/I to be less than the T/I so determined unless it can be shown that the availability of the affected receiver would still be acceptable despite the interference.

(ii) For receivers employing analog modulation: manufacturer data or industry criteria will specify a baseband signal-to-noise requirement (S/N) of the receiver that will result in acceptable signal quality for continuous operation. Following TSB 10 or other generally acceptable good engineering practice, for each potential case of interference a C/I objective shall be calculated to ensure that this S/N will not be degraded by more than 1.0 dB. For the range of carrier power levels (C) between the clear-air (unfaded) value and the fully-faded threshold value, in no case shall interference cause C/I to be less than the objective so determined unless it can be shown that the signal quality and availability of the affected receiver would still be acceptable despite the interference.

* * * * *

(c) * * *

* * * * *

(2) * * *

* * * * *

(ii) *Adjacent Channel Interference.* Applicable to all bands except the 71-76 GHz and 81-86 GHz bands because those bands are unchannelized: the existing or previously authorized system must be afforded a carrier to interfering signal protection ratio of at least 56 dB.

* * * * *

Geographic Coordinate Accuracy

The Joint Reply Comments submitted in February 2003 reflected broad agreement "that conventional GPS accuracy will be sufficient for site coordination in almost all cases, and that in special cases where further coordination is required, the coordinator may require an applicant to provide a higher level of accuracy for his endpoints and those of a potential interferer." Since that time, however, further research on the limits of "conventional GPS accuracy" and additional computer simulations indicate that somewhat greater accuracy should be required by rule.

The fundamental issue is that station coordinates must be accurate enough to support dense deployment, but the accuracy standard must not be so demanding as to require professional site surveys that will deter market entry by increasing both cost and delay. A brief survey of GPS receivers as of August 2003 indicated that only surveying-class GPS receivers are capable of providing ±1 meter accuracy. Consumer-class GPS receivers that are WAAS-enabled typically provide ±3 meter latitude and longitude accuracy, with vertical accuracy about 5x worse. One brand of consumer-class GPS receiver can export data which can then be post-processed to achieve ±1 meter accuracy, but the manufacturer states this is an unsupported feature. At least one other company's marketing information states that consumer-class GPS receivers with associated post-processing software capable of providing ±1 meter accuracy will be available before the end of 2003. At present, however, this level of accuracy is relatively expensive and the timing of future improvements is uncertain.

The approach advocated by the Above 60 GHz Committee is based on the premise that higher-power transmitters cause more interference, and that more accuracy should therefore be demanded from them. Consequently, lower-power transmitters (EIRP $\leq$ 40dBW) should be permitted to use the less expensive but also less accurate class of GPS receivers in order to achieve horizontal accuracy within 3 meters and vertical accuracy within 15 meters. Higher-power transmitters (EIRP > 40dBW), which are more expensive in any event, should be accurate within 1 meter horizontally and within 5 meters vertically. As the cost of higher-power transmitters comes down, so too will the cost of higher levels of horizontal and vertical accuracy. The Above 60 GHz Committee therefore recommends that the accuracy standards in various sections of the Commission's rules be amended as follows:

2. Section 1.923 is amended by revising subparagraph (c) to read as follows:

§ 1.923 Content of applications

* * * * *

(c) *Antenna locations.* Applications for stations at fixed locations must describe each transmitting antenna site by its geographical coordinates and also by its street address, or by reference to a nearby landmark. Geographical coordinates, referenced to NAD83, must be specified in degrees, minutes, and seconds to the nearest second of latitude and longitude. For stations operating in the bands 71 – 76 GHz and 81 – 86 GHz these coordinates must be specified to 0.01 seconds.

* * * * *

3. Section 101.21 is amended by revising the "NOTE" immediately thereafter to read as follows:

§ 101.21 Technical Content of Applications

* * * * *

NOTE: The position location of antenna sites shall be determined to an accuracy of no less than ±1 second in the horizontal dimensions (latitude and longitude) and ±1 meter in the vertical dimension (ground elevation) with respect to the National Spatial Reference System.

However, in the bands 71-76 GHz and 81-86 GHz, vertical coordinates shall be specified relative to height above mean sea level. In these bands, transmitters with greater than 40 dBW EIRP shall meet a horizontal accuracy of ±1 meter and vertical accuracy of ±5 meters and transmitters with 40 dBW EIRP or less need only meet horizontal accuracy of ±3 meters and vertical accuracy of ±15 meters.

* * * * *

4. Section 101.103 is amended by revising the "NOTE" immediately after subparagraph (d)(2)(ii), to read as follows:

§ 101.103 Frequency Coordination Procedures

* * * * *

(d) * * *

* * * * *

(2) * * *

* * * * *

(ii) * * *

* * * * *

Practical threshold of the receiver to be coordinated

NOTE: The position location of antenna sites shall be determined to an accuracy of no less than ±1 second in the horizontal dimensions (latitude and longitude) and ±1 meter in the vertical dimension (ground elevation) with respect to the National Spatial Reference System.

However, in the bands 71-76 GHz and 81-86 GHz, vertical coordinates shall be specified relative to height above mean sea level. In these bands, transmitters with greater than 40 dBW EIRP shall meet a horizontal accuracy of ±1 meter and vertical accuracy of ±5 meters and transmitters with 40 dBW EIRP or less need only meet horizontal accuracy of ±3 meters and vertical accuracy of ±15 meters.

* * * * *

C/N-Based Operation of ATPC

The February 2003 Joint Reply Comments reflect some disagreement within the industry as to whether ATPC should be regulated based on C/N ratios or power flux-densities. As a result of computer simulations showing that the C/N method provides superior performance, the Above 60 GHz Committee urges the Commission to amend section 101.113 by revising paragraph (b) to read as follows:

5. Section 101.113 is amended by revising paragraph (b) to read as follows:

§ 101.113 Transmitter power limitations

* * * * *

(b) (1) The power of transmitters that use Automatic Transmitter Power Control shall not exceed the power input or output specified in the instrument of station authorization. The power of non-ATPC transmitters shall be maintained as near as practicable to the power input or output specified in the instrument of station authorization.

(2) Transmitters operating in the 71-76 GHz and 81-86 GHz bands with EIRP in excess of +23 dBW must possess capability for Automatic Transmitter Power Control over a dynamic range in dB of at least {EIRP in dBW of the radiating device} – 23, or 0 dB, whichever is greater. Transmit power for these stations must be adjusted such that one of the following two conditions is met at all times: (i) C/N at the receiver is no greater that 10 dB above the static threshold specified 101.105(a)(6); or (ii) the transmitter has reduced its output power to the required minimum specified in this subparagraph.

* * * * *

The Above 60 GHz Committee hopes and trusts that these consensus industry proposals will help the Commission complete its consideration of licensing and operational rules for the 70/80 GHz bands. Please feel free to contact any of the undersigned with any questions.

Respectfully submitted,

/s/ Andrew Kreig
President
Wireless Communications Ass'n International

/s/ Doug Lockie
/s/ Lou Slaughter
Co-Chairs, WCA Above 60 GHz Committee

/s/ David S. Stephenson
Chair, Interference Calculation Subcommittee
WCA Above 60 GHz Committee

copies:
Sam Feder
Julius Knapp
Jennifer Manner
Mike Marcus
Paul Margie
Barry Ohlson
Jim Schlichting
Scot Stone
Ed Thomas
Fred Thomas
Bryan Tramont