Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
The Establishment of Policies and Service	)	IB Docket No. 99-81
Rules for the Mobile Satellite Service in	)	RM-9328
the 2 GHZ Band	)	

PETITION FOR RECONSIDERATION

The Wireless Communications Association International, Inc. ("WCA"), by its attorneys and pursuant to Section 1.429 of the Commission's Rules, hereby petitions the Commission to reconsider its decision in the *Report and Order* (the "*Order*") in this proceeding to reject WCA's proposal to amend Section 25.202(f) of the Commission's Rules to assure that out-of-band emissions from Mobile Satellite Service ("MSS") downlink usage of the 2165-2220 MHz band do not cause interference to Multipoint Distribution Service ("MDS") facilities operating in the nearby 2150-2162 MHz band.[1] On reconsideration, the Commission should amend Section 25.202(f) to require 2 GHz MSS satellite systems, at a minimum, to maintain their power flux density at the earth's surface within the MDS 2150-2162 MHz band to –172 dBW/m² using a 4 kHz resolution bandwidth.

At the outset, WCA applauds the Commission for clarifying in the *Order* that 2 GHz MSS receivers must be designed to accept interference from MDS operations that comport with the MDS spectral mask and power limitations adopted in 1998, and for determining that any MSS feeder uplink use must protect existing and future Local

[1] *Establishment of Policies and Service Rules for the Mobile Satellite Service in the 2 GHz Band*, 15 FCC Rcd 16127 (2000).

Multipoint Distribution Service ("LMDS") uses.[2] However, as the trade association to the fixed wireless broadband communications industry, including MDS licensees in the 2150-2162 MHz band and manufacturers of equipment used to provide digital and analog communications services in that band, WCA is disappointed that the Commission has not seen fit to amend Section 25.202(f) to provide MDS operations in the 2150-2162 MHz band adequate protection from MSS downlink transmissions. Without adequate out-of-band emissions protection, MDS operations in the 2150-2162 MHz band are likely to suffer significant interference from MSS systems operating in the nearby 2165-2200 MHz band and, as a result, the deployment of innovative fixed wireless broadband services by MDS licensees will be hampered.

The fundamental problem with Section 25.202(f) is patent. In its initial and reply comments in this proceeding, WCA established the need for revised restrictions on MSS out-of-band emissions by pointing out that: (1) the spectral mask for MSS set forth in Section 25.202(f) is defined relative to the transmitted power (rather than establishing any absolute limit on out-of band emissions); and (2) the Commission has not proposed any limitation on MSS transmitted power.[3] Consequently, within 250% of the authorized MSS bandwidth (which would include emissions into the 2150-2162 MHz band) the Commission's Rules do not require attenuation to any particular absolute level.

WCA was hardly alone in recognizing the flaw in this approach. The National Telecommunications and Information Administration ("NTIA") similarly recognized that the proposed MSS spectral mask fails to provide meaningful protection to adjacent

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[2] *Id.* at 16168, 16195.

[3] WCA Comments at 7-8; WCA Reply Comments at 3.

operations because it only requires out-of-band attenuation relative to the in-band transmitted power, and there is no maximum permitted in-band power limit.[4] Although NTIA's comments were focused upon potential MSS interference to Governmental use of the spectrum above the 2165-2200 MHz MSS allocation, NTIA's point is equally valid with respect to MDS and other services operating below 2165 MHz.[5]

Significantly, the Commission itself expressly acknowledged in its *Order* that "2 GHz MSS systems' transmitters are expected to emit [a] certain amount of power outside of their assigned frequency band . . . [which] may cause interference to services operating in adjacent frequency bands."[6] Despite this acknowledgment, the *Order* provides for disparate treatment of Government operations in the 2025-2110 MHz band and MDS operations in the 2150-2162 MHz band, although both are adjacent to MSS operations at 2165-2200 MHz. Specifically, the *Order* requires that "2 GHz MSS operators [] account for existing Government's space operations in the adjacent bands," i.e. 2025-2110 MHz, but extends no such requirement to MDS operations in the 2150-2162 MHz adjacent band.[7]

WCA suspects that this disparate treatment may be the result of some fundamental misconceptions by the Commission regarding WCA's proposal. Although WCA had initially suggested that restricting MSS out-of-band emissions in the 2150-

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[4] *See* Comments of Nat'l Telecommunications and Information Admin., IB Docket Mo. 99-81, at 20-21 (filed June 24, 1999).

[5] *Id.*

[6] *Order* at 16195-96.

[7] *Id.* at 16194.

2162 MHz band to –190 dBW/m² would adequately protect MDS,[8] it subsequently provided the Commission with evidence that to adequately protect MDS, Section 25.202(f) should be amended "to impose a requirement that 2 GHz MSS systems be required, at a minimum, to maintain their power flux density within the 2150-2162 MHz band at the earth's surface to –208 dBW/m²/Hz (or its equivalent of –172 dBW/m² using the 4 kHz resolution bandwidth generally used in Part 25)."[9] As this language makes clear, WCA's interference protection proposal focuses solely on MSS out-of-band emissions that fall *within the 2150-2162 MHz band*. The *Order*, however, suggests that the Commission believed WCA was proposing a restriction on MSS in-band emissions levels.[10] However, as emphasized in its initial comments, and reemphasized here, "WCA has no interest whatsoever in establishing restrictions on the *in band* power levels that can be generated by 2 GHz MSS systems. WCA's sole interest is in assuring that MSS out-of-band emissions be sufficiently attenuated in the 2150-2162 MHz band so as to not cause what would be perceived by MDS stations as co-channel interference."[11]

The specific restriction proposed by WCA was based upon technical analyses that had been submitted to the Commission by BellSouth Wireless Cable, Inc. establishing that satellite operations in the 2.3 GHz band would have to restrict power flux density to –172 dBW/m² using a 4 kHz resolution bandwidth in order to protect Wireless

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[8] *See* WCA Comments at 9.

[9] WCA Reply Comments at 3. For reasons unbeknownst to WCA, that revised proposal was not addressed at all in the *Order*.

[10] *Order* at 16195.

[11] WCA Comments at 8 (emphasis in original).

Communications Service ("WCS") operations in the 2.3 GHz band.[12] As WCA noted, "[s]ince the system architectures and equipment for terrestrial operations in the 2.3 GHz [WCS] band are very similar to those used by operators in the 2.1 GHz bands (and, in many cases, are intended to be integrated with MDS operations), this power flux density limit appears to be equally applicable to protect MDS operations in the 2150-2162 MHz bands."[13] For the convenience of the Commission, that analysis is annexed hereto as Attachment A.

In short, WCA has no objection to the deployment of MSS in the 2 GHz band, but considers it essential that the Commission adopt rules sufficient to protect MDS operations at 2150-2162 MHz from out-of-band MSS emissions. Therefore, WCA encourages the Commission to reconsider its decision and amend Section 25.202(f) of the Commission's Rules to require 2 GHz MSS systems to maintain their power flux density at the earth's surface within the MDS 2150-2162 MHz band to –172 dBW/m² using a 4 kHz resolution bandwidth.

WHEREFORE, for the foregoing reasons, WCA urges the Commission to amend the rules adopted in the *Order* in the manner proposed above so as to assure that MDS operations in the 2150-2162 MHz band will be afforded adequate interference protection from MSS operations at 2 GHz.

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[12] *See* Letter from Karen Possner, BellSouth Wireless Cable, Inc. to John O'Connor, Wireless Telecommunications Bureau, regarding discussions with government of Mexico to coordinate use of 2305-2360 MHz band (filed July 16, 1999).

[13] WCA Reply Comments at 4 n.8.

Respectfully submitted,

THE WIRELESS COMMUNICATIONS
ASSOCIATION INTERNATIONAL, INC.

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November 3, 2000

ATTACHMENT A

BELLSOUTH

6. BSC.135.1

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July 16, 1999

Hand Delivered

Mr. John O'Connor
Licensing & Technical Analysis Branch
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Federal Communications Commission
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Washington, D.C. 20554

Dear Jay:

In response to the Commission's letter of July 6, 1999 and a request at our meeting of July 8th, I am writing on behalf of BellSouth Corporation and BellSouth Wireless Cable, Inc. (collectively, "BellSouth") to provide the Commission with additional information for use by the United States in its upcoming discussions with the government of Mexico regarding coordination of the 2305-2360 MHz band.

In our March 8, 1999 letter to Tom Stanley, we provided a discussion of our explorations into the possibility of using our 22 Wireless Communications Service ("WCS") authorizations for three possible applications -- video, high-speed Internet access and wireless local loop. A copy of that letter is enclosed for your reference. At that time, we advised the Commission that "[b]ecause the United States has yet to receive detailed information regarding possible Mexican uses of the WCS spectrum, it is impossible for BellSouth to ascertain the risk of interference at this time." We warned, however, that "given the likely sensitivity of each of these possible uses to interference from a Mexican satellite service utilizing the WCS spectrum, the need for international limitations on cochannel satellite services is clear."

We believe our warning has proven prescient. Upon receipt of the information contained in the Commission's July 6th letter concerning Mexico's intention to utilize the WCS spectrum for a satellite service, BellSouth commissioned Hardin & Associates, Inc. ("Hardin") to examine the potential impact of the proposed Mexican satellite service on BellSouth's use of its WCS authorizations. Enclosed is a copy of a report which establishes that in order to avoid increasing the thermal noise floor of the terrestrial WCS receiver more than 1 dB, it will be necessary to limit the power flux density from the Mexican satellite at the earth's surface within the United States to no more than -172 dBW/m^2 measured over 4 kHz.

We look forward to continuing to work with the Wireless Telecommunications Bureau to coordinate WCS usage of this spectrum with possible Mexican uses. Should you have any questions regarding BellSouth's analysis of the potential impact of the proposed Mexican satellite service, please do not hesitate to call.

Sincerely,

Enclosures

cc: Thomas Stanley

HARDIN & ASSOCIATES, INC.
• WIRELESS COMMUNICATIONS •

Engineering Statement

If a satellite based delivery service in Mexico is to coexist in frequency with a terrestrial based WCS system in the United States, the power flux density of the satellite signal must be restricted at the Mexican boundaries so as to minimize the level of potential co-channel interference to terrestrial receivers in the US. A reasonable methodology for limiting interference, especially with regards to digital signals, is to restrict the amount of increase to the thermal noise floor of a receiver caused by the addition of power from an interfering signal. The digital satellite signals will have a relatively uniform power spectral density and will thus look like broadband noise to the terrestrial receiver. Therefore, the interference will appear as an increase in the thermal noise floor of the receiver. Any increase in the noise floor will directly result in a sacrifice of the performance of the terrestrial system. There is precedent in other FCC documents dealing with terrestrial microwave and wireless performance that shows a 1 dB increase in the thermal noise floor of the receiver is a reasonable comprise between interference acceptance and continued acceptable performance.

The thermal noise floor of a receiver can be calculated from the formula

$$N_{(thermal)} = kBN_t \quad \text{(dBW)} \qquad (1)$$

where

k = Boltzman's constant 1.38×10^{-23} (dBW/°KHz)

B = bandwidth (Hz)

N_t = Noise temperature of the antenna system (293 °K).

For a 4 KHz channel bandwidth as used in the Mexican analysis of the potential for interference from the satellite based system, equation (1) yields a noise floor level of –137 dBm. In order to prevent an increase in the noise floor of no more than 1 dB, the level of interference from the satellite signal must be at least 6 dB below the noise floor. Therefore, the level of interference from the satellite signal must be -143 dBm or less.

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This received signal level can be translated back to an EIRP at the satellite transponder through the following formula

$$EIRP = R_{sat} - G_{rx\ ant} + L_{free\ space} + P_{discrm} - 30 \quad (dBW) \qquad (2)$$

where

R_{sat} = Received signal level from satellite (dBm)

$G_{rx\ ant}$ = Gain of receive antenna (dBi)

$L_{free\ space}$ = Free space path loss to satellite (dB)

P_{discrm} = Discrimination due to circular to plane polarization (3 dB).

For the received signal level calculated previously (-143 dBm) and a receive antenna gain of 31 dBi as used in the Mexican calculations, equation (2) yields an EIRP at the transponder of –10 dBW. The power flux density at the earth's surface can be calculated from the formula

$$PFD = EIRP/(4*\pi*r^2) \quad (watts/m^2) \qquad (3)$$

where

r = the distance to the earth's surface (m).

For –10 dBW of EIRP, equation (3) yields a power flux density of 6.1402×10^{-18} watts/m^2 or –172 dBW/m^2*4KHz. Therefore, the power flux density from the Mexican satellite at the earth's surface within the US should be limited to –172 dBW/m^2*4KHz in order to limit the increase in noise floor to no more than 1 dB and preserve the operational integrity of the WCS service.

This engineering statement was prepared by George W. Harter, CTO of Hardin and Associates, Inc., a professional consulting firm licensed in the Commonwealth of Virginia and whose credentials are a matter of record with the Commission.

George W. Harter

July 15, 1999

BELLSOUTH

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March 8, 1999

Mr. Thomas Stanley
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Dear Tom:

In response to your request at our meeting last week, I am writing on behalf of BellSouth Corporation and BellSouth Wireless Cable, Inc. (collectively, "BellSouth") to provide the Commission with additional information for use by the United States in its upcoming discussions with the government of Mexico regarding coordination of the 2305-2360 MHz band.

Through the Commission's competitive bidding process, BellSouth has secured 22 Wireless Communications Service ("WCS") authorizations. When the Commission established WCS, it recognized that because of the Congressional requirement to complete the auction for this new service rapidly and the need for rather restrictive technical limitations to protect the satellite Digital Audio Radio Service ("SDARS"), WCS licensees would likely require substantial time to identify the highest and best use of the spectrum and deploy systems. That has proven to be the case at BellSouth, which is exploring possible uses for its WCS spectrum, but has yet to settle upon any specific application.

To date, BellSouth has focused most of its exploratory efforts on three possible applications – video, high-speed Internet access and wireless local loop. Although at this preliminary stage only limited technical information is available, each of these is discussed below. Because the United States has yet to receive detailed information regarding possible Mexican uses of the WCS spectrum, it is impossible for BellSouth to ascertain the risk of interference at this time. However, given the likely sensitivity of each of these possible uses to interference from a Mexican satellite service utilizing the WCS spectrum, the need for international limitations on cochannel satellite services is clear.

Using WCS Spectrum For Video Distribution

BellSouth currently operates wireless cable television systems utilizing Multipoint Distribution Service ("MDS") and Instructional Television Fixed Service ("ITFS") spectrum at 2150-2162 MHz and 2500-2690 MHz in Atlanta, New Orleans, Orlando, Lakeland, Ft. Myers and Louisville. Additional systems currently are under development in Daytona Beach, Jacksonville and other cities in its southeast region. Because the maximum bandwidth available to a wireless cable operator using just MDS and ITFS is 198 MHz, additional spectrum may be required to effectively compete with other video providers, some of which have up to 750 MHz of spectrum available. BellSouth has been examining the possible use of its WCS spectrum to augment its MDS/ITFS channels. Although there are several technical issues remaining to be addressed, BellSouth believes that since the WCS spectrum occupies frequencies between the lowest and highest MDS/ITFS channels, it should be possible to incorporate WCS spectrum into its wireless cable systems.

The architecture of a BellSouth video system utilizes a main transmit site and multiple repeater sites to broadcast to subscribers. The main transmit site broadcasts an analog vestigial sideband signal or a 64-QAM digital signal at power levels typically in the 500-2000 watt EIRP level and with antenna patterns utilizing cardioid and omnidirectional antenna patterns. The repeaters or boosters rebroadcast on the same frequencies with power levels ranging from –9 to 33 dBW. A subscriber utilizes a directional antenna and block downconverter to receive the microwave signals and convert them to cable frequencies. The receive antenna can have beamwidths ranging from approximately 40 degrees to 2 degrees with gains ranging from 12 to 32 dBi. The downconverter typically has a gain of 36 dB. The set-top box (analog or digital decoder) has a sensitivity of -20 dBmv. Terrain, foliage, buildings and other obstructions can significantly degrade the microwave signal, therefore additional fade margins of 20-30 dB must be incorporated into system designs to achieve reasonable areas of reliable coverage.

In BellSouth's February 8, 1999 Reply in the proceeding regarding the application by WCS Radio, Inc. for authority to construct, launch and operate two communications satellites that would use WCS spectrum to provide SDARS, BellSouth specifically addressed the potential risk of interference from a SDARS system located in geostationary orbit. A copy of that analysis, which may prove relevant once more is known regarding the Mexican government's intentions with respect to the WCS frequencies, is enclosed.

Using WCS for High Speed Internet or Other Data Services

BellSouth is also exploring the possibility of using WCS spectrum for a symetrical or asymmetrical high speed Internet or other data service. Equipment currently is available to allow the deployment of an asynchronous high speed data system using WCS frequencies for

downstream communication and hard wire telephone lines for the upstream. This application can augment existing wireless cable systems as the same transmission sites can be utilized to broadcast the downstream data service. Service sets such as residential and commercial Internet access are ideal candidates for this application since the demand for speed is primarily on the downstream path. The system architecture likely would be the same as previously described for the video service. The same type of reception equipment (downconverter and antenna) can be utilized to receive the 64-QAM signal used to transmit the downstream data service. The wireless cable modem likely would have an operating range of -20 dBmV to +10 dBmV and requires a S/N: >= 26dB for 1x10-9 BER after FEC.

In addition, BellSouth is exploring the possibility of deploying a symmetrical data service on a commercial basis using the WCS spectrum. Both downstream and upstream could be broadcast on the WCS frequencies, or the WCS frequencies could be used in one direction and MDS/ITFS frequencies used for the other. A cellular architecture likely would be utilized, with frequency reuse in all the cells. In MM Docket No. 97-217, the Commission has before it a proposal relating to the use of subscriber transmitters operating at no more than -6 dBW EIRP for MDS/ITFS upstream transmissions, and it is possible that similar upstream power levels would be used by BellSouth should it deploy upstream facilities on its WCS spectrum.

Using WCS for Wireless Local Loop

Extending the existing hard wire telephone network into certain areas has proven to be expensive, difficult or prohibited. For example, the inability to set poles or dig in an area due to historical preservation limitations may prevent the expansion of cost effective telephone service. However, BellSouth is examining the possible use of WCS spectrum and wireless local loop technology to provide high speed data, voice and ultimately video. Such a service could be extended quickly, unobtrusively and in a very cost effective manner. Additionally, the WCS frequencies could provide a cordless extension service as an enhancement to the wireless local loop. The protocol technology that might be used in this service has not been selected, and will depend on the size of the area, the population density and the services to be offered.

In addition to these three uses, BellSouth has begun to preliminarily investigate the possible use of its WCS spectrum for wireless backhaul, transport and point-to-point microwave systems, in-home wireless distribution systems, home and personal security, video conferencing, digital audio radio and mobile telephony. However, because BellSouth has not yet focused extensively on these possible uses, no technical details are available at this time.

BellSouth looks forward to working with the Commission as the United States attempts to coordinate the usage of this spectrum with the Mexican government. At such time as the United States is afforded technical information regarding possible Mexican usage of the WCS band, BellSouth will be happy to provide the Commission with a more detailed analysis of the impact that the proposed Mexican usage will have on BellSouth's ability to deploy new services using its WCS authorizations. In the interim, should you have any questions regarding BellSouth's plans for WCS, please do not hesitate to call.

Sincerely,

Enclosure

cc: John O'Connor

ENGINEERING STATEMENT IN RESPONSE TO THE CONSOLIDATED OPPOSISTION OF WCS RADIO, INC.

File Nos. SAT-LOA-19981113-00085/86

This engineering statement has been prepared in response to the above listed comments filed by WCS Radio, Inc. on January 26, 1999. Hardin and Associates, Inc. ("Hardin") represents a group of WCS licensees who filed a petition to dismiss or deny the WCS Radio application for the authority to operate a satellite based DARS service in the WCS frequency band. The initial comments filed by Hardin demonstrated serious concerns regarding the potential for interference to potential services the WCS licensees have the ability to offer under their authorizations. However, WCS Radio has responded to Hardin's comments by attempting to dismiss the potential for interference by limiting the scope of their technical analyses such that the true potential for interference is masked. Further explanation of the interference potential will be discussed in this document as well as other inaccurate statements by WCS Radio will be brought to light.

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1) The proposed WCS Radio DARS system cannot offer full CONUS coverage without prohibiting the ability of the licensed WCS operators not participating in the WCS Radio venture from offering DARS services.

WCS Radio continues to purport they can offer full CONUS coverage without the participation of all of the WCS license holders. However, as was demonstrated in the statement submitted by Comsearch as Attachment A in the original petition to deny, yet was not addressed by WCS Radio in its opposition, the proposed WCS Radio system would preclude any other satellite based DARS system from operating in this band. Therefore, in those regions where all of the frequency band is licensed to a single

operator or to multiple operators not participating in the WCS Radio venture, such operators would be precluded from offering a DARS service.

As an example, BellSouth Wireless Cable, Inc. ("BellSouth") is one of the companies joining in this petition. BellSouth purchased the WCS licenses in large areas of the southern and southeastern United States. Indeed, BellSouth purchased all of the WCS licenses (A, B, C and D blocks) in a major portion of this area. Since BellSouth is not a part of the WCS Radio joint venture, WCS Radio must give protection in the BellSouth licensed areas. This protection must include protecting the potential for BellSouth to offer a satellite based DARS service. The only way this protection is possible is if WCS Radio prevents its DARS signal from reaching the BellSouth service areas. This can only be achieved through the use of spot beams by WCS Radio. Therefore, WCS Radio will not be able to offer full CONUS service.

2) The WCS Radio claim that the potential for terrestrial based receive antennas in a fixed point-to-multipoint application to have elevation angles greater than 20 degrees is low because of the geometry involved are incorrect.

In the Hardin statement submit with the petition (as attachment B), an example was given of the potential for interference from the WCS Radio proposed system to a typical application involving a receive site for a fixed, two-way data service such as Internet access. In the example Hardin demonstrated that when the geometry is such that a receive site for the terrestrial service has an elevation angle where no antenna discrimination is present, a significant potential for interference exists.

WCS Radio does not dispute this fact, but rather attacks the potential for a receive antenna to have the necessary 20 degrees (30 degrees in the BellSouth and Shell licensed

areas) of elevation angle to meet this condition. The examples presented by WCS Radio deal with receive sites which are relatively distant from the transmit site and show how the transmit to receive antenna height ratio would have to be inordinately large to achieve the elevational angle.

However, WCS Radio is completely ignoring situations where the transmit site may be located in the midst of an urban or suburban area with receive sites in very close proximity to the transmit site. There are numerous examples of this situation since the area BellSouth alone controls is full of large cities with very large urban and suburban areas. As a first example, BellSouth is currently operating a wireless cable system using MDS and ITFS frequencies (2.5 to 2.686 GHz) in the Atlanta, GA market. BellSouth is using multiple transmit sites in the Atlanta area. One such site is the NationsBank building located in downtown Atlanta. The height of the transmit antennas on the roof of NationsBank is 1,017 feet AGL and 1,018 feet AMSL. Using the same geometry formulas described by WCS Radio, for a 900 foot transmit/receive height differential, a receive site would have to be approximately 1,559 feet away to achieve the 30 degree angle to NationsBank. There are numerous buildings within this distance of NationsBank. Similarly, there are three other transmit sites with antenna heights ranging from approximately 1,400 to 1,800 feet AMSL. Assuming a 1,300 to 1,700 foot transmit/receive height differential, any buildings within 2,250 to 2,945 feet of these sites could easily achieve the 30 degree look angle.

Another example is the situation where a hub site is actually lower in height than a return path transmission. If a deployment of WCS hub or node sites were made in an urban area

where a cellularized system is employed utilizing many hub or node sites with relative low heights (such as a PCS deployment), the potential could exist for a hub site to actually be significantly lower in height than one of the subscriber locations transmitting back to the hub. The antennas that will be used at the hub sites will have little elevational discrimination, as these antenna systems are designed to collect signals from a variety of distances throughout the service area. In fact, in the situation being described here, some of the sectors could actually employ up tilt to handle return path transmissions from taller buildings in the urban areas. No antenna discrimination would be available to eliminate interference as was described in the original petition supported by Hardin.

WCS Radio is also conveniently forgetting that services in this frequency range have a wide variety of receive antennas to choose from with various gains and beamwidths. Low gain receive antennas are readily available with beamwidths in excess of 30 degrees in both azimuthal and elevational patterns. These antennas would most commonly be used at receive sites close in to the transmit site. Using antennas of this type significantly increase the probability of an unobstructed electrical path to the satellite signal. In the case of a subscriber using a 30 degree receive antenna beamwidth, which is a very common antenna used at the receiver in the deployment of Wireless Cable systems. Using the example from Atlanta given above, a receive site could move out to a distance of over 3,000 feet from the 1,559 feet and receive the satellite signal with no discrimination.

It is unreasonable for WCS Radio, because of their limited understanding of possible system architectures and geometry, to whole handedly dismiss the examples given in the

petition and given here. As has been shown, there is a real potential for interference from the WCS Radio proposed system and therefore the system should not be permitted to operate as proposed.

3) The presumptions WCS Radio is making regarding received signal strength are not necessarily adequate for all applications and do not account for other phenomena in the propagation environment affecting received signal strength.

WCS Radio is arguing that closer a receive site is to the transmitter site, the larger the received signal level will be and the less likely the satellite signal will cause interference. For the most part, this philosophy is true. However, when in close proximity to a transmit site, the elevational antenna pattern of the transmit antenna will play a significant part in the determination of the received signal level. Antenna patterns may have nulls in the elevational pattern causing as much as 15-20 dB of attenuation at various points within 1 mile of a transmit site. Similarly, when in close proximity to the transmit site, a receive site will typically use lower gain receive antennas with a broader beamwidth as described above. Therefore, received signal strengths do not follow straight lines as shown in Figure 2 of the WCS Radio Opposition.

In addition, there are other propagational phenomena in a wireless environment affecting signal level. Some examples are signal blockage from natural or man made structures and multipath. Multipath is an especially troublesome issue in a dense urban environment.

The transmitted power levels described by WCS Radio in Figure 2 of their opposition are not all inclusive of the levels necessary to run any type of service. Many services can operate on power levels much lower than those listed by WCS Radio. As an example, the Commission recognizes in its MDS rules the application of low power boosters with an EIRP of -9 dBW or less (section 21.913(g)). This level is 14 dB below the minimum level depicted in the WCS Radio chart. In addition, there are many technologies that allow very low received signal levels to be utilized for good performance. Any degradation in the noise floor by a satellite interferer would reduce the performance of these systems.

4) WCS Radio's dismissal of the ability to create mobile applications in the WCS spectrum is unfounded and not supported by the Commission's Rules.

WCS Radio has incorrectly concluded that the WCS out-of-band emission limits prohibit mobile applications. The Rules specifically state that mobile applications are permissible and define in several sections of the technical standards for these operations. Granted, a license holder of just the C or D block frequencies may have difficulty allocating sufficient guardband to meet the emission limits in the 2320 – 2345 MHz band for mobile applications. However, a license holder of the entire block of frequencies has more than ample spectrum.

Therefore, the analysis submitted by Hardin in the petition is correct. If, as WCS Radio has stated in its opposition, each of the satellites will be transmitting on different frequencies there will be a 3 dB improvement in the level of predicted interference. However, there will still be 5.6 dB overall degradation in the noise floor.

5) **WCS Radio's offer to operate on a secondary, non-interference basis has no merit since the satellite signal cannot be turned off to eliminate interference.**

WCS Radio has proposed to operate on a secondary, non-interference basis in areas where the WCS licensees are not part of the WCS Radio project. However, how is WCS Radio going to eliminate interference to mobile applications or fixed link applications with an unobstructed electrical path to the satellite that cannot be corrected by means other than turning off the satellite signal? The offer of secondary status has no merit as one could certainly envision applications where extraordinary or even impossible means would have to be undertaken to give interference protection to all of the receive sites of the WCS licensee. One very good example is a mobile application where interference is occurring to mobile receivers.

Statement of Engineer

This engineering statement was prepared by James C. Cornelius, who is a consulting engineer with the firm of Hardin and Associates, Inc., and a Professional Engineer licensed in the Commonwealth of Virginia and whose credentials are a matter of record with the Commission. The information contained herein was prepared by him and it is true and correct to the best of his knowledge.

James C. Cornelius, P.E.

Hardin and Associates, Inc.

February 7, 1999