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FEDERAL COMMUNICATIONS COMMISSION
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BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C. 20554

In the Matter of	)	
	)	
Redesignation of the 17.7-19.7 GHz Frequency Band, Blanket Licensing of Satellite Earth Stations in the 17.7-20.2 GHz and 27.5-30.0 GHz Frequency Bands, and the Allocation of Additional Spectrum in the 17.3-17.8 GHz and 24.75-25.25 GHz Frequency Bands for Broadcast Satellite-Service Use	)	IB Docket No. 98-172 RM-9005 RM-9118

To: The Commission

COMMENTS OF BELLSOUTH

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COMMENTS OF BELLSOUTH

BellSouth Corporation ("BellSouth"), by its attorneys, hereby submits its comments in response to the Commission's *Notice of Proposed Rulemaking* (*"NPRM"*) in this proceeding.[1] Various BellSouth subsidiaries are licensees of private operational fixed service ("OFS") and common carrier point-to-point microwave fixed service ("FS") facilities operating in the 17.7-19.7 GHz ("18 GHz") band.[2] Because these facilities are essential components in several of its communications offerings, BellSouth opposes any changes that would jeopardize current or future use of this spectrum by incumbent OFS/FS licensees.

SUMMARY

The Commission attempts to balance the interests of the incumbent terrestrial fixed microwave community with those of prospective satellite service providers by redesignating the 18

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[1] FCC 98-235 (released September 18, 1998), *summarized*, 63 Fed. Reg. 54100 (1998). The Commission subsequently issued an *Order* (DA 98-2231) on November 2, 1998 extending the pleading cycle.

[2] The OFS and FS services are herein collectively referred to as "terrestrial" services as distinguished from satellite services.

GHz band among these services. BellSouth fundamentally disagrees, however, with the Commission's underlying premise that, technically, these disparate services can co-exist on a co-primary basis in common spectrum allocations. To this end, BellSouth endorses the carefully crafted band plan being proposed by the Fixed Wireless Communications Coalition ("FWCC").

Unlike the Commission's proposal, this plan recognizes the need for terrestrial and satellite facilities to operate in different parts of the 18 GHz band. The FWCC plan also preserves the current spectrum allocation at 18.142-18.580 GHz for Cable Television Relay Service ("CARS") and OFS use, and provides a logical distribution of paired channels for FS use. Moreover, the FWCC plan creates a new allocation for use by the satellite industry on a primary basis by redesignating spectrum formerly allocated on a co-primary basis between FS and satellite service. Because this plan equitably addresses the spectrum needs of all interested parties, the FCC should adopt the FWCC plan.

Balancing between the needs of the terrestrial fixed microwave community and the needs of the satellite industry, the Commission should recognize that the satellite industry is still in its nascency and that the spectrum needs of the satellite industry are not yet clearly defined or definable. In this regard, there are *no* commercial satellite systems currently operating in the Ka-band[3] and a new analysis forecasts "*diminished* long-term market opportunity" and reduced demand for providers of mobile satellite service.[4] These factors certainly suggest that the satellite interests will need less of the 18 GHz band than proposed in the *NPRM*.

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[3] *NPRM* at ¶ 40.

[4] Caron Carlson, *Mobile Satellite Services Meet Reality*, Wireless Week, Nov. 9, 1998, at 16 (emphasis added). The prediction for reduced demand is premised on the rapid growth of "alternative global communications tools," such as the WorldPhone by Bosch Telecom that permits roaming between GSM and analog cellular markets, continued expansion of cellular markets to remote regions, and the introduction of third-generation wireless services. *Id.*

BellSouth strongly objects to any suggestion that another relocation of 18 GHz FS licensees is necessary. OFS and FS use of the 18 GHz band is well-established, extensive, and serves the public interest. The 18 GHz band is well-suited to accommodate the future growth needs of OFS and FS users. Moreover, FS users have already been subject to several disadvantageous reallocations and numerous relocations.

If the Commission nevertheless adopts rules that will require the relocation of FS licensees (assuming technically equivalent spectrum for such migration actually exists), the Commission should adopt the same procedures used to relocate FS licensees from the 2 GHz band.[5] Specifically, the satellite industry must be required to compensate FS licensees for all relocation costs.

I. BELLSOUTH HAS SIGNIFICANT CURRENT AND FUTURE SPECTRUM NEEDS IN THE 18 GHz BAND

As the Commission recognizes, terrestrial fixed services serve a variety of important spectrum needs and make robust use of the 18 GHz band.[6] Thus, there is an important public interest need in preserving this spectrum for terrestrial fixed services and ensuring that future growth of these services in the 18 GHz band is not impeded.

Under the Commission's plan, however, the amount of spectrum for terrestrial use on either a primary or co-primary basis would be greatly reduced. This spectrum reduction is exacerbated because the *NPRM*'s proposed allocation would divide frequency pairs between primary and secondary status; the net effect in such cases is that even the spectrum that remains primary FS spectrum is useless because of the limitations imposed on the paired channels.

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[5] *See Redevelopment of Spectrum to Encourage Innovation in the Use of New Telecommunications Technologies*, ET Docket No. 92-9, *Second Report and Order*, 8 FCC Rcd 6495 (1993)(subsequent history omitted).

[6] *NPRM* at ¶ 8.

In other words, the half of a frequency pair that would be relegated to secondary status would be required to accept interference from any primary use in its part of the band. Thus, the normally expected high reliability associated with terrestrial microwave would be rendered meaningless. To avoid this, the Commission must alter its proposal to ensure that sufficient portions of the 18 GHz band are preserved for primary use by terrestrial providers to meet their current needs and anticipated growth.

As compared with the important 18 GHz spectrum requirements of the terrestrial fixed services, the nascent fixed satellite services industry cannot presently identify with certainty the amount of its future spectrum requirements. Indeed, in the *NPRM* the Commission speaks only of the "potential" uses of satellite services.[7] The Commission should not adopt a band plan that would jeopardize the terrestrial fixed services that have real and identifiable current and future spectrum requirements in favor of satellite demand forecasts that are speculative, at best.

A. OFS Operations in the 18.14 to 18.58 GHz Band for Wireless Cable Services

BellSouth's wholly-owned subsidiary, Wireless Cable of Atlanta, Inc., is presently licensed to operate OFS links in the 18.14-18.58 GHz band (which is shared with CARS), and anticipates continued growth in the number of such links. BellSouth utilizes the 18.14-18.58 GHz band to provide high quality, high capacity analog/digital multiplexed video delivery services to its customers in competition with incumbent wired cable operators. BellSouth has recently launched digital wireless cable services in the Atlanta, New Orleans, and Orlando areas, targeting approximately 1.85 million households, and will be available to approximately 550,000 more when service is expanded to Daytona and Jacksonville next year. This competitive initiative for wireless

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[7] *NPRM* at ¶ 9.

cable services thus meets Congressional objectives to increase the competitive video programming offerings available to consumers.[8]

The spectrum available in the 18.14 to 18.58 GHz band provides a cost-effective alternative frequency band for transmission to booster sites, which are essential to the wireless operator to improve coverage with high quality signals. If the 18.14 to 18.58 GHz band is reallocated or subdivided such that it is of no use as a broadband retransmission medium, the 2.5 to 2.686 GHz MDS/ITFS band must be retransmitted. Such retransmission adds complexity to the design of the network and creates coverage loss due to self-intraference from additional transmitters and retransmission of signal operating on the same frequencies. Alternative wired transport options, such as fiber optics, may not be available or can be cost prohibitive. Since wireless cable is a line-of-site business, the 18.14 to 18.58 GHz band also is the only viable vehicle with sufficient bandwidth for reaching potential customers that do not have a clear path to a Multipoint Distribution Service ("MDS")/Instructional Television Fixed Service ("ITFS") transmitter site.

The 18.14-18.58 GHz band also provides the only alternative contiguous spectrum available to the wireless cable operator to transport services from one location to another. In order to compete effectively with the 750 MHz and greater capacity available to incumbent wired cable operators, wireless cable licensees construct mini-headend facilities at various high population density multiple dwelling units to augment the limited capacity available in the MDS/ITFS spectrum. Furthermore, as explained in the attached report (included as Exhibit I) prepared by Hardin and Associates, Inc. (the "Hardin Report"), wireless cable operators require the full 18.14 to 18.58 GHz band (440 MHz)

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[8] *See* Cable Television Consumer Protection and Competition Act of 1992, § 2(b), Pub. L. No. 102-385, 106 Stat. 1460 (1992); Telecommunications Act of 1996, §§ 651-653, Pub. L. No. 104-104, 110 Stat. 56 (1996). *See generally In the Matter of Annual Assessment of the Status of Competition in Markets for the Delivery of Video Programming, Fourth Annual Report*, 13 FCC Rcd 1034, ¶¶ 7, 9, 10 (1998).

to support 72 channels of video programming and thus remain competitive with incumbent wired cable service providers.[9]

Given the above (and particularly with the Commission's recent authorization of two-way, cellularized wireless cable services that will increase the demand for point-to-point microwave interconnection capabilities), preservation of the 18.14-18.58 GHz band is necessary for BellSouth and the wireless cable industry as a whole to remain competitive and to expand their service offerings.[10] However, the Commission's plan would break up the 18.14-18.58 GHz band across three different sub-bands, ranging from primary FS, to secondary FS, to co-primary FS. To the extent that any portion of the current 18.14-18.58 GHz band is made secondary, future growth becomes immediately impossible because the grandfathering proposal would deny wireless cable service providers utilizing CARS/OFS licenses the ability to improve capacity or expand coverage. Furthermore, even where CARS/OFS would remain co-primary, any future growth of satellite services would effectively preclude future CARS/OFS uses and threaten current uses due to the fact that CARS/OFS cannot operate in the same band as satellite services without serious interference concerns (*see* discussion *infra* at Section II).

The FWCC plan ensures that the shared CARS/OFS spectrum remains intact. Moreover, that plan avoids any need for sharing with traditional FS uses. This is essential because traditional FS cannot operate in the same band as the shared CARS/OFS allocation due to coordination difficulties, a fact that the Commission recognized.[11] Furthermore, the portions of spectrum that would remain primary or co-primary for FS uses under the Commission's proposal are already heavily

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9 *See* Exhibit I at 2.

10 *See Id.* at 1.

11 *NPRM* at ¶ 27. *See also* the Exhibit I at 3 ("the coordination process . . . would be virtually impossible").

encumbered, and will only become more so once the entire 17.7 to 19.7 GHz band is no longer available on a co-primary basis for FS use. BellSouth, therefore, supports the FWCC recommendation to preserve the shared CARS/OFS spectrum in its current form as the only workable solution to ensure the future viability and competitiveness of the wireless cable industry.

B. Common Carrier Fixed Point-to-Point Usage of the 18 GHz Band

Various BellSouth subsidiaries licensed to operate commercial mobile radio service ("CMRS") facilities extensively use the 18 GHz band for back-haul communications needs. BellSouth currently operates 74 single 18 GHz paths, and has future plans for additional links. Under the Commission's proposal, BellSouth would have its point-to-point links spread throughout the primary FS, secondary (grandfathered) FS, and co-primary FS bands.

This scheme would be unworkable for BellSouth. Secondary status has the immediate effect of halting any future growth, which would also affect the paired channels. The grandfathering plan proposed in the *NPRM* does not offer much help because grandfathered licensees, as proposed, would not be able to expand or change operations in any manner if the result would be increased interference to satellite earth stations.[12] Furthermore, as discussed below, FS links simply cannot share spectrum with satellite operators, further prohibiting future growth in the proposed co-primary spectrum and the paired channels. The result would be that the FS incumbents would be required to relocate.

BellSouth notes that the FS industry has already had to endure disruptive relocation of facilities to other bands.[13] The 18 GHz band is becoming increasingly important as an alternative

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[12] *NPRM* at ¶ 40.

[13] In ET Docket No. 92-9, incumbents operating in the 1850-1990, 2110-2150, and 2160-2200 MHz bands were required to relocate so that the spectrum could be cleared for emerging technologies uses. *Redevelopment of Spectrum to Encourage Innovation in the Use of New*

band for displaced 2 GHz point-to-point operations. If the 18 GHz band is also to become unavailable, the point may have been reached where alternative FS spectrum can no longer be identified. While fiber optic cable can be a substitute for 18 GHz links, it is not always the preferred solution. As an initial matter, fiber is less available and/or more costly in rural locations. Furthermore, wireless facilities add the option of both route and technology diversity, which BellSouth has utilized in its operations in the southeastern United States. The better solution for serving the public interest is to preserve wireless transport options in addition to landline facilities, thus necessitating continued availability of viable 18 GHz spectrum for FS use.

Thus, the Commission should refrain from adopting a scheme that would dictate the relocation of any FS or OFS 18 GHz facilities. However, if the Commission holds otherwise, new entrants, at a minimum, should be required to pay for any relocation costs consistent with FCC precedent.[14] The emerging satellite industry should be treated no differently than other emerging industries, such as PCS, which appropriately have been made responsible for the relocation costs of displaced incumbent licensees. *See* ET Docket No. 92-9, ET Docket No. 95-18.

Telecommunications Technologies, Second Report and Order, 8 FCC Rcd 6495 (1993)(subsequent history omitted). The 1850-1990 MHz band in particular is allocated to Personal Communications Services ("PCS"), the licensees of which were required to purchase their spectrum at auction in addition to being made responsible for relocation costs. Similarly, in ET Docket No. 95-18, incumbents including CARS licensees operating in the 1990-2110 MHz band and FS licensees in the 1990-2025, 2110-2130, and 2165-2200 MHz bands were also relocated to make way for emerging technologies. *Amendment of Section 2.106 of the Commission's Rules to Allocate Spectrum at 2 GHz for Use by the Mobile-Satellite Service*, ET Docket No. 95-18, *First Report and Order and Further Notice of Proposed Rule Making*, 12 FCC Rcd 7388 (1997). The Commission has just adopted today a *Memorandum Opinion and Order* which affirms its prior decision to apply the relocation policies of ET Docket No. 92-9 to the MSS proceeding. *FCC Affirms Decision to Make More Spectrum Available for Mobile-Satellite Service for the 21st Century*, FCC News (Nov. 19, 1998).

[14] *NPRM* at ¶ 41.

II. FIXED SERVICES CANNOT SHARE SPECTRUM WITH SATELLITE OPERATIONS

The Commission recognized that sharing in the 18 GHz band is not feasible due to coordination problems and that sharing will adversely impact new or expanded FS uses, stating "the public interest is best served by redesignating the 17.7-19.7 GHz band to separate terrestrial fixed services from most satellite earth station operations."[15] Given this conclusion, it is inconsistent for the Commission to advance a band plan that endorses the fundamental premise that co-primary sharing of spectrum between FS and non-ubiquitous satellite services is possible. As indicated in a report included as Exhibit II addressing "exclusion zones" in the 18 GHz band, unacceptable interference is likely to occur when FS and satellite services operate in the same frequency bands, regardless of whether satellite co-primary operations are expected to be ubiquitously or non-ubiquitously deployed.

As explained in the accompanying report, exclusion zones existing around any single satellite earth station would be necessary to prevent unacceptable interference.[16] These exclusion zones define geographic areas of such size that any deployment of a satellite earth station would entirely preclude future expansion of OFS and FS operations over a large area in co-primary bands. Similarly, as the Hardin Report (Exhibit I) demonstrates, an interference zone can extend as far as 45 miles from an OFS transmit site, resulting in significant interference to satellite receive stations

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15 *NPRM* at ¶ 19.

16 *See* Exhibit II at 1; *see also NPRM* at ¶ 17 (discussing exclusion zone issue raised by TIA).

and thus precluding future expansion of OFS uses.[17] The Hardin Report also indicates that there is a potential for significant interference from satellite systems to *existing* OFS facilities.[18]

Even if the satellite deployments are prior coordinated and of the "gateway" nature the Commission expects, once a gateway station is in place (including within congested urban areas), surrounding FS facilities could not expand — calculations would predict harmful interference to the co-primary earth station.[19] Thus, any FS spectrum allocated on a co-primary basis should be viewed as unavailable for any growth and it cannot be counted on as truly available spectrum.[20]

III. BELLSOUTH SUPPORTS THE COMMENTS BEING FILED BY THE FIXED WIRELESS COMMUNICATIONS COALITION

The FWCC plan provides a good compromise to balance the needs of the terrestrial and satellite industries. BellSouth supports this plan because it improves the FCC's proposal in the following ways:

- the loss of terrestrial spectrum would be reduced from 53.3% under the FCC proposal to 35% under the FWCC proposal;
- the 18.14-18.58 GHz band would be preserved for CARS/OFS use;
- point-to-point services would not have to share spectrum with point-to-multipoint one-way video distribution services, where coordination would otherwise be very difficult;
- paired FS operation would be permitted between the 17.7-18.14 GHz and 19.26-19.7 GHz bands, which solves the problems created by the FCC's plan which makes the 17.7-17.74 GHz and 18.55-18.8 GHz co-primary bands unavailable for future growth due to the fact that

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[17] *See* Exhibit I at 2. The Hardin Report also details how factors such as the minimal discrimination capabilities of the small aperture satellite receive antennas and terrain scatter of CARS/OFS signals contribute to the interference problems. *Id.*

[18] *See Id.* at 1.

[19] *See Id.* at 2; *See also* Exhibit II at 1.

[20] For these same reasons, BellSouth opposes the proposed future allocation of the 17.7-17.8 GHz band to broadcast satellite services ("BSS") because ubiquitously deployed BSS earth stations cannot share with FS.

the 19.26-19.3 GHz band and 18.92-19.16 GHz band are respectively paired and are made secondary;

- co-primary MSS/FL operations in the 19.26-19.7 band can be successfully shared with FS since the FWCC plan would subject the MSS/FL services to certain conditions, including limiting operation to remote areas, requiring at least 25 dB shielding for 360 degrees, and limiting coordination to only the frequencies and arcs necessary;

- the 18.58-18.82 GHz and 18.92-19.16 GHz bands are allocated to satellite services and given up for future FS operations (existing use would be grandfathered on a co-primary basis and relocation would be at the expense of satellite service providers), which solves a problem with the FCC's plan to allocate the 18.3-18.55 GHz and 18.92-19.16 GHz bands to satellite receivers because these receivers would be unable to coexist with grandfathered FS in these bands; and

- moving the 18.3-18.55 GHz band to 18.58-18.8 GHz causes ubiquitous satellite terminals to share spectrum with each other.

CONCLUSION

The Commission must recognize that terrestrial use of the 18 GHz band is extensive and currently provides many public benefits. Given this, and the fact that the spectrum needs of satellite services are speculative at best and, in fact, may be declining, the Commission must preserve sufficient 18 GHz spectrum for terrestrial use. Failing that, the Commission must provide technically equivalent replacement spectrum and full cost reimbursement for any relocations. Finally, as demonstrated in the attached technical reports, the concept of exclusion zones makes any co-primary allocations between satellite and terrestrial uses entirely unworkable. For these reasons,

BellSouth urges adoption of rules consistent with the above and with the comments being filed by the FWCC.

Respectfully submitted,

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EXHIBIT I

Statement of Engineer

This statement was prepared by James C. Cornelius, a consulting engineer with the firm of Hardin and Associates, Inc., a professional engineering firm licensed in the state of Virginia and whose credentials are a matter of record with the Commission.

James C. Cornelius

November 12, 1998

18 GHz Redesignation Issues

In the Notice of Proposed Rulemaking, IB Docket No. 98-172, the Commission is proposing to redesignate the 17.7-19.7 GHz band among the various allocated services in an effort to allow a more efficient sharing of the spectrum between terrestrial fixed services and ubiquitously deployed FSS earth stations. As part of this plan, the Commission is proposing to redesignate approximately 57% of the 18.14-18.58 GHz service to a GSO/FSS primary service and to redesignate another 7% to a co-primary status between the two services. For convenience, the 18.14-18.58 GHz service is referred to throughout this report as "CARS," but all references apply equally to private operational fixed uses of the 18.14-18.58 GHz band. This redesignation of 64% of the CARS frequencies effectively eliminates the 18.14-18.58 GHz band as a viable bandwidth to accomplish the intended goals of the service. This will effectively cripple future usage of this band for CARS applications and results in a defacto freeze.

The current CARS allocation is available to operators of wireless cable systems. Wireless operators utilize the CARS frequencies to interconnect the main transmit site with booster sites. Wireless cable systems have the ability to operate utilizing conventional analog or digital video signals. In addition, a recently released report and order proposed new rules for the use of two-way digital technology in a wireless cable environment. The wireless cable system architecture is becoming a distributed transmission or cellular design. With these trends, the need for site interconnects and backhaul links becomes more severe. The CARS links provide excellent, cost effective means for addressing these needs.

The following issues are present with the Commission's current proposed redesignation scheme.

1. **The proposed downlink power flux density values for the GSO/FSS services in the 18.3-18.58 GHz band have the potential to cause significant interference to existing CARS AML links.**

   The Commission is proposing a power flux density of –120 dBW/m^2/MHz averaged over any contiguous 40 MHz band segment and –118 dBW/m^2/MHz in any 1 MHz band. If we assume boresighted conditions between the satellite and the CARS receive antenna, this power flux density would create a noise level of –88.9 dBm in a 4 MHz bandwidth using a 40 dB gain receive antenna. If we also assume a typical CARS transmitter (Blonder Tongue TX18000 & PA18000) with a transmit antenna gain of 40 dB, the EIRP of the CARS transmit system will be 39.4 dBm. Assuming a 2 mile path, the resulting C/I caused by the satellite signal is approximately 41 dB. Since this is an analog AML link, 41 dB of C/I represents a significant degradation in picture quality and eliminates any fade margin for the link. In fact, current FCC regulations with regards to the minimum signal quality delivered to a subscriber based on carrier-to-noise is 43 dB (reference CFR47, Part 76.605(a)(7) of the Commission's Rules).

   Since the GSO/FSS satellites can exist over a wide arc, the potential for achieving a boresighted condition can exist. Look angles from the CARS receive antennas to the satellites will vary significantly dependent on the location of the earth station in the country and the position of the satellite in orbit. Look angles can easily vary from 3 to 65 degrees. When you consider that most CARS systems are located in urban environments where the transmit antenna may reside on a tall building and the receive antennas are looking up, one can very easily achieve a tilt to the CARS receive antenna that will coincide with the look angle to a satellite. When this occurs, severe interference will occur as described previously.

2. **The potential for interference from existing and future terrestrial fixed service CARS systems operating in the 18.3 to 18.55 GHz frequency band to the proposed ubiquitously deployed GSO satellite receivers would be severe, thus eliminating this portion of the spectrum for future use by CARS.**

   Because future CARS systems operating in this band would be secondary to the GSO satellite systems, all future CARS links would be required to protect GSO receivers. Since ubiquitously deployed GSO receive systems will (1) use small aperture antennas, (2) be located anywhere and (3) be numerous, it will be virtually impossible for the CARS operator to protect all potential GSO receivers.

   A CARS system has the potential to operate with as much as 316 KWatts (+55 dBW) of EIRP per current FCC rules. Although the rules allow use of this power level, current equipment available to the 18 GHz CARS industry places a practical limitation of approximately +30 dBW EIRP per RF channel. Using this EIRP, an interference zone can be determined for the area around a CARS transmit site where satellite receivers will not be capable of operation. The size of this zone will be determined by the EIRP and antenna pattern of the CARS system, the attenuation of the satellite antenna to the undesired CARS signal (discrimination) and the sensitivity of the satellite receiver. The discrimination of the satellite antenna is determined by the look angle to the satellite and the angle between the satellite receive antenna and the CARS transmit antenna. Both the azimuthal and elevational discrimination of the satellite antenna must be considered in the calculation of potential interference.

   Attached as Exhibit 1 is a detailed technical analysis showing the calculation of the potential interference zone. If we assume interference to the satellite receive system is defined as a 1 dB degradation in the noise floor, a 2 foot diameter CARS transmit antenna, a typical satellite look angle and the +30 dBW EIRP for the CARS system; the length of the interference zone can extend as far as 45 miles from the CARS transmit site. Even though the width of the zones is narrow, placement of several CARS links around an area will result in a significant area of potential interference.

3. **The analysis submitted above and in Exhibit 1 does not take into account the increased interference potential to satellite receive systems based on terrain scatter of the CARS signals.**

   The 18 GHz signals are of sufficiently small wavelength such that many objects will be effective reflectors of the CARS signals. Terrain, buildings and other manmade structures will reflect the CARS signals in a multitude of directions dependent on the angles of incidence. Therefore, the potential will exist for interference to be reflected into a satellite receive system. It is impossible to estimate the extent to which this interference could occur, since the shape, size and location of the buildings causing the scatter could be almost infinite.

4. **Assuming the 18.3-18.55 GHz band is eliminated from CARS, the remaining band segment from 18.14-18.3 GHz is insufficient for wireless cable CARS applications.**

   Limiting the spectrum to 160 MHz in the 18.14-18.3 GHz range will limit the wireless cable operator to a maximum of approximately twenty-six 6 MHz channels. The current wireless cable allocation from 2.5-2.686 GHz allows the transmission of 31 channels. Insufficient spectrum would be available to transmit the entire MDS and ITFS allocations. The wireless cable operator is at a severe competitive disadvantage with 31 channels, much less 26.

5. **Relocating the CARS band to the 17.7-18.3 GHz band is not practical because the coordination process to add new CARS links in with existing FS links would be virtually impossible.**

   The quantity of existing FS links in the 17.7-18.3 GHz band is large, especially in the urban markets. The configuration on most CARS links follows the hub and spoke architecture, where a single transmit site will serve multiple receive sites. An interference zone can be created around a fixed service receive site showing the area of potential interference from a CARS installation. If we assume the CARS transmit antenna can be pointed at the fixed service receive site and operating with +30 dBW EIRP as was assumed in our previous example, an interference zone can be created. Attached as Exhibit 2 is a diagram showing the interference zone around each of the fixed service receive sites listed in the Dallas, TX area from the FCC on-line database. From this diagram one can immediately see the preclusive effect of the existing fixed service stations.

6. **Relocating the CARS band to a higher frequency spectrum is not practical given the sensitivity of the AML link and the need for reasonable path lengths.**

   For a typical CARS band link operating at +30 dBW EIRP and a 2 mile path length, the path reliability is approximately 99.9% with a fade margin of 20 dB. This level of performance is reasonable for an analog television system. However, moving this spectrum higher in frequency will begin to encroach on the margin and ultimately result in an unacceptable path length to accomplish the goals of the system.

7. **18 GHz CARS usage is currently most heavy in urban markets and future growth is expected to be in these same markets. Satellite services will be very extensive in these markets as well, further increasing the difficulty for CARS systems to protect satellite services.**

   Because of the high cost and limited range of the 18 GHz CARS signal, a majority of the links in use today are located in major urban markets. This trend is expected to continue with continued expansion in almost all major markets. Because of the population density in these markets, it is reasonable to expect the satellite services will concentrate here as well and make the implementation of future CARS systems virtually impossible.

8. **Placing the 30 MHz of spectrum located between 18.55-18.58 GHz in a co-primary status between GSO/FSS and FS renders this spectrum as ineffective as the 18.3-18.55 GHz band.**

   Because the CARS links operate in a block conversion mode, allowing 30 MHz of spectrum to exist at the top of the band does not alleviate the need for bandwidth. This spectrum is virtually useless without the full block of bandwidth available.

Exhibit 1

The thermal noise floor can be calculated from:

$P_N = kTB$

where

P_N is the noise spectral density

k is Botzman's constant 1.38×10^{-23} Watts/K/Hz

T is the noise temperature which assumed at 293 K

B is Bandwidth

Assuming a 1 MHz reference bandwidth, the above equation gives a noise spectral density of –143.9 dBW/MHz. Assuming the criterion for non-interference to a satellite receiver is to limit the interfering signal such that it will cause no more than a 1 dB increase in the noise spectral density. In order to limit the noise spectral density increase to no more than 1 dB, the interfering signal level must be no more than –149.8 dBW/MHz.

The current FCC proposal would place GSO/FSS receivers ubiquitously throughout the country in the 18.3 to 18.55 GHz range. In footnote 26 of the NPRM, the Commission references applications filed and orbital locations assigned by thirteen applicants for GSO/FSS satellites. These assignments range from 173° east longitude to 148° west longitude.

Satellite look angles can vary dependent on the position of the earth station and the position of the satellite. The look angles from satellites in geosynchronous orbit to the Atlanta area can vary from 11 degrees to 56 degrees based on the location of the satellite in the sky. A geosynchronous satellite can cover approximately 162 degrees of the earth, centered at its position. It was assumed that a typical look angle of 30 degrees would be reasonable. This would give a typical elevational antenna discrimination. Also an azimuth attenuation was taken at a discrimination angle of 4 degrees, which is looking just off of boresight to give a significant amount of attenuation. This gave an overall antenna discrimination of 62 dB. (At 2-FT earth station antenna was assumed.)

$$P_R = EIRP + G_E - D_E - D_A - 96.6 - 20\log(f) - 20\log(d)$$

where

P_R is the power received at the output of the antenna which is set to - 149.8 dBW/MHz

EIRP is the power output from the CARS antenna which is set to + 30 dBW or 22.2 dBW/MHz

G_E is the gain of the satellite antenna at boresight which is set to 45 dBi

D_E is the look angle attenuation of the satellite receive antenna which is approximately 40 dB at 30 degrees off of boresight

D_A is the azimuthal attenuation of the satellite receive antenna is approximately 22 dB at 4 degrees off of boresight

$-96.6 - 20\log(f) - 20\log(d)$ is free space path loss expression where the frequency is assumed at 18.4 GHz

Solving for distance utilizing +30 dBW, an exclusion zone can be created with a maximum distance of 45 miles. If antenna discrimination is reduced, the exclusion zone will significantly increase. The boundary has the characteristics of a typical CARS antenna. The following figure shows the exclusion zone for BellSouth in the Atlanta, GA area.

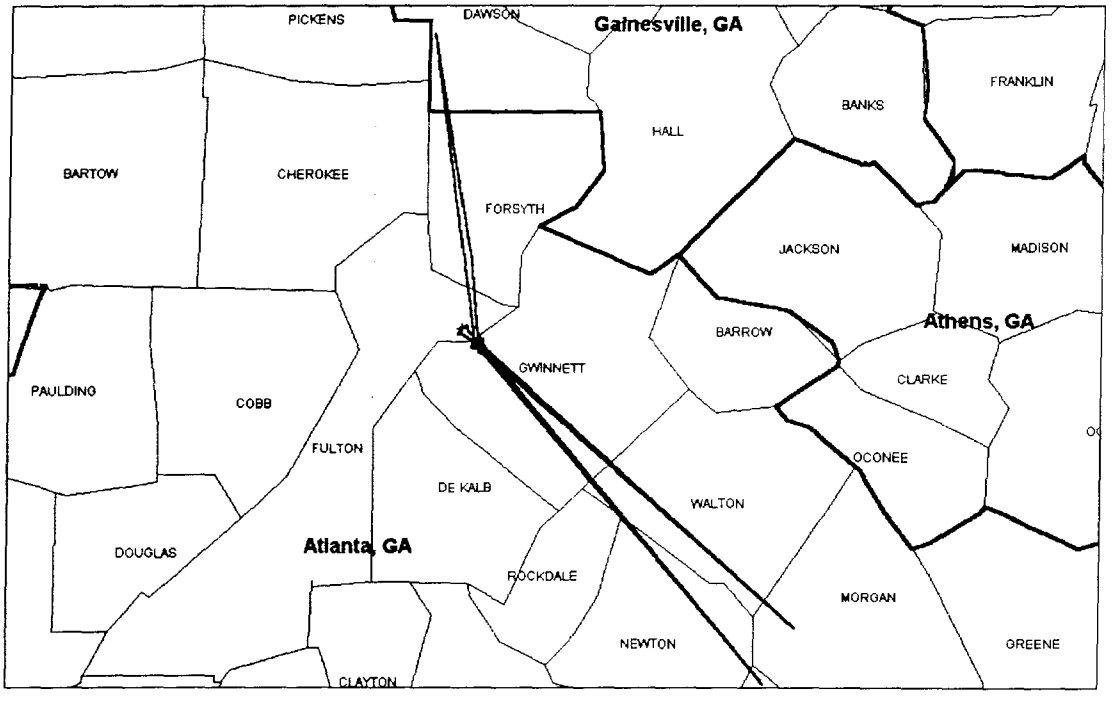

Exhibit 2

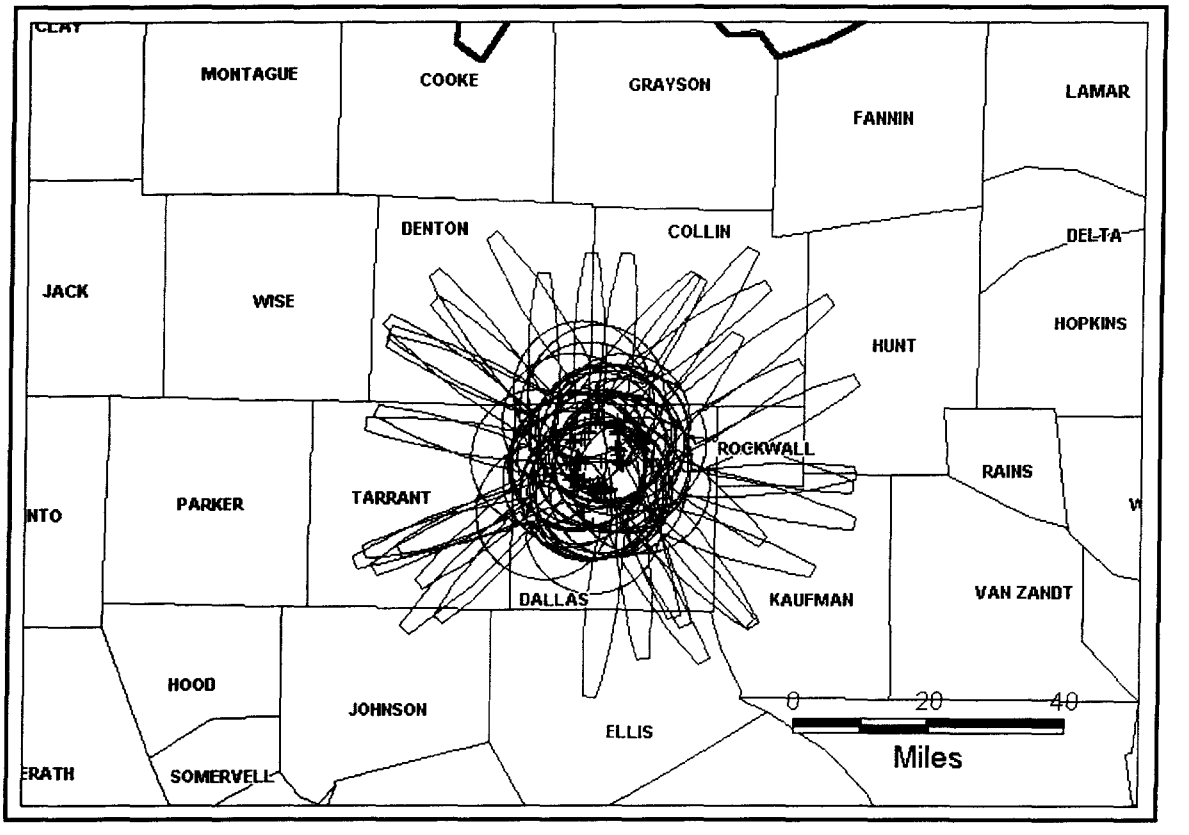
MONTAGUE
COOKE
GRAYSON
FANNIN
LAMAR
DENTON
COLLIN
DELTA
JACK
WISE
HUNT
HOPKINS
ROCKWALL
RAINS
PARKER
TARRANT
DALLAS
KAUFMAN
VAN ZANDT
HOOD
JOHNSON
ELLIS
SOMERVELL
0
20
40
Miles

EXHIBIT II

STATEMENT OF ENGINEER

I, David Lee, have reviewed the attached statement and attest for its accuracy. I am a Registered Professional Engineer with over 25 years of experience in the telecommunications industry, including 12 years of experience in the radio engineering and frequency coordination field. I am currently employed by BellSouth Mobility Inc as Director — Spectrum Management and FAA/FCC Compliance, and serve on the Board of Directors of the National Spectrum Managers Association ("NSMA") and as Chairman of the NSMA PCS Working Group. I hold an M.S., Electrical Engineering, from the University of Alabama at Birmingham, and a B.S., Electrical Engineering from Mississippi State University.

T. David Lee, PE

November 17, 1998

Discussion of Exclusion Zones in the 17.7 to 20.2 GHz Frequency Band

In scenarios where different services are allocated frequency spectrum on a co-primary basis, care must be taken to ensure that neither service will produce unacceptable interference into the other service. Consideration has been given to allowing fixed service (FS) point-to-point microwave links to operate in specific sections of the 17.7 to 20.2 GHz band on a co-primary basis with the fixed satellite service (FSS). Calculations presented to the 18 GHz Joint Working Group (JWG), an industry working group comprising FS and FSS technical representatives formed to study the issues related to sharing in the 17.7 to 20.2 GHz band, clearly demonstrate that unacceptable interference is likely to occur from FS transmitters into satellite Earth stations using typical and/or proposed values for key operational parameters.

In order to avoid this interference, the concept of an exclusion zone around an FSS Earth station has been developed that defines a geographic area in which an FS transmitter would be prohibited from operating. This would preclude the possibility of that particular FSS Earth station from receiving unacceptable interference from an FS transmitter. Note that, in order for FS and FSS systems to operate with co-primary allocations in a common frequency band, the exclusion zone concept must be applied to each individual FSS Earth station. The topic of this paper is to discuss the feasibility of using exclusion zones to support co-primary operation of the FS and FSS services in the 17.7 to 20.2 GHz band.

As stated above, an exclusion zone is a geographic area in which a particular service is prohibited from operating. Our primary focus here concerns the interference from FS transmitters into satellite Earth stations. The dimensions of an exclusion zone are highly dependent upon several key parameters including the FS transmitter effective isotropic radiated power (EIRP), the FS antenna gain in the direction of the Earth Station (ES), the ES horizontal gain (i.e., in the direction of the FS transmitter), and the received power level at the ES that results in unacceptable interference to the FSS system (normally referred to the receiver sensitivity).

Using the FS transmit power limitations identified in CFR Part 101 Section 113 and typical values for the FS and FSS antenna gains, it can be shown that the exclusion zone dimensions will be on the order of tens to hundreds of kilometers in length, depending upon the actual transmitter/receiver discrimination angles and the FSS receiver sensitivity, and up to several kilometers wide at the half maximum length point.

In situations for which the density of satellite Earth stations is low, it may be plausible to implement such a large exclusion zone since the numbers of FS transmitters affected, on the whole, might be relatively low. This would assume, of course, that the existing FS transmitters would be treated on a primary basis and would not be required to move and/or modify their operations due to the introduction of future FSS Earth stations.

However, as the number of satellite Earth stations increases or, in situations where there are a large number of satellite Earth stations anticipated to support a particular FSS

system market plan, such exclusion zones would be unacceptable since they would essentially prohibit all future expansion of FS operations in any area in which the FSS systems operate. For the case in question, that is the 17.7 to 20.2 GHz band, the FSS systems clearly expect to deploy satellite Earth stations ubiquitously across the United States. This ubiquitous deployment, along with the large exclusion zones needed to preclude unacceptable interference to the FSS Earth stations would, in effect, preclude any future deployments of FS links across the United States in the 17.7 to 20.2 GHz band. It should be noted that this conclusion is valid for both geostationary and non-geostationary FSS systems.

In summary, several key points have been made regarding the feasibility of using exclusion zones to support sharing between FS and FSS systems in the 17.7 to 20.2 GHz frequency band: (1) exclusion zones are necessary to preclude unacceptable interference between FS transmitters and FSS Earth stations, (2) the exclusion zone dimensions range from tens to hundreds of kilometers in length and up to several kilometers wide, and (3) ubiquitous deployment of FSS Earth stations would preclude any future deployment of FS links across the United States for those parts of the 17.7 to 20.2 GHz band in which the FS and FSS services are given co-primary allocation. The points above are based on calculations using realistic data for the FS transmit power limitations identified in CFR Part 101 Section 113 and typical values for the FS and FSS antenna gains, and are consistent with the quantitative results generated by the 18 GHz JWG. Based upon the above points, it is concluded that sharing between FS and FSS systems on a co-primary basis in the 17.7 to 20.2 GHz band is not possible via the implementation of exclusion zones and will only result in the demise of future FS operations in this frequency band.

CERTIFICATE OF SERVICE

I, Shelia L. Smith, hereby certify that on this 19th day of November 1998, copies of the foregoing "Comments of BellSouth" in IB Docket No. 98-172 were served by hand on the following:

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