



## SUMMARY

The terrestrial microwave and fixed satellite services which currently share the 3.7-4.2 GHz band (the "Downlink") and the 5.925-6.425 GHz band (the "Uplink") (collectively the "C-Band") on a co-primary basis have developed a frequency plan which, as a result of considerable effort, has been quite successful and makes efficient use of the C-Band spectrum. The success of this sharing has been due for the most part to the use of Terrestrial Interference ("TI") filters, which are the most cost-effective and reliable technique by which satellite earth stations, primarily home television receive-only ("TVRO") units, avoid harmful terrestrial interference. However, the TI filters presently employed by the satellite services are designed around and dependent upon the current frequency plan which has been in place for many years.

The Commission in its FNPRM has proposed to rechannelize the C-Band with respect to terrestrial microwave services. The Commission's stated goal is to use the C-Band spectrum to accommodate microwave users in the 2 GHz band that may need to be relocated to make room for important new technologies, such as personal communications services ("PCS"). HBO supports the Commission's effort to foster new technologies, and it believes that sharing the C-Band frequencies with some of the potentially displaced microwave users can be accommodated provided that the existing frequency plan is maintained. The rechannelization proposal, however, will create a totally different frequency use

environment and will have very disruptive and costly consequences for existing users of the C-Band, especially the users in the video distribution industry.

Of particular concern are the home satellite TVRO users. The proposed rechannelization will render current TI filters used by home TVRO units obsolete and could subject such units to severe terrestrial interference. The smaller bandwidth channel pairs in the proposed rechannelization essentially could eliminate the use of four (4) satellite transponders, two (2) transponders at each end of the Downlink. The proposed 10 MHz bandwidth channel pairs could create harmful interference to every satellite transponder in the Downlink. Such harmful and pervasive interference cannot be tolerated by the home TVRO industry. Neither employing additional TI filters nor modifying their location in the frequency plan will avoid effectively the potential interference caused by new terrestrial microwave users under the proposed rechannelization. The rechannelization would reduce the useable bandwidth of the C-Band video transponders to the point where the picture quality would no longer be acceptable.

With respect to the entire C-Band, if the present frequency plan is not maintained and made applicable to the microwave services which relocate pursuant to the Commission's proposal, an inequitable number of them may relocate to the C-Band, placing a larger burden on current C-Band users to coordinate and adjust to the relocation. Maintaining the current frequency plan would

permit the high capacity 2 GHz users to relocate in the C-Band and spread the burden of coordinating with the relocated microwave services more equitably.

The proposed rechannelization and the subsequent interference and economic injury that would result are directly contrary to the Commission's prior practice and stated policy of avoiding undue hardship on existing users when reallocating spectrum. It is also contrary to the Commission's and industry's cooperative development of C-Band satellite communications, a practice fostered by the Commission since the inception of domestic satellite communications.

Therefore, HBO requests that the Commission not adopt its proposed rechannelization plan. Instead, the Commission should permit any displaced 2 GHz microwave users to share C-Band spectrum only under the frequency plan currently in use and should restrict such relocation by 2 GHz users to those users which require at least 20 MHz channel capacity.

## Table of Contents

SUMMARY .....	i
Table of Contents .....	iv
I. INTEREST OF HBO .....	3
II. BACKGROUND .....	4
A. Current C-Band Users .....	4
B. The Commission's Proposed Rechannelization .....	6
III. THE CURRENT C-BAND CHANNELIZATION HAS SERVED EXISTING USERS WELL .....	7
IV. THE PROPOSED CHANNELIZATION COULD CAUSE HARMFUL INTERFERENCE AND SEVERE ECONOMIC INJURY TO THE EXISTING USERS OF THE C-BAND .....	11
V. THE COMMISSION SHOULD MAINTAIN THE FREQUENCY PLAN CURRENTLY USED IN THE C-BAND TO EQUITABLY SPREAD THE DISPLACED 2 GHz USERS AMONG THE AVAILABLE BANDS .....	12
VI. ADOPTION OF THE PROPOSED CHANNELIZATION WOULD BE CONTRARY TO COMMISSION POLICY .....	14
CONCLUSION .....	16

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BEFORE THE  
**Federal Communications Commission**  
WASHINGTON, D. C.

FEDERAL COMMUNICATIONS COMMISSION  
OFFICE OF THE SECRETARY

In the Matter of	)	
	)	
	)	
Redevelopment of Spectrum to	)	ET Docket No. 92-9
Encourage Innovation in the	)	
Use of New Telecommunications	)	RM - 7981
Technologies	)	RM - 8004

**COMMENTS OF  
HOME BOX OFFICE,  
A Division of Time Warner Entertainment Company, L.P.**

Home Box Office ("HBO"), a Division of Time Warner Entertainment Company, L.P., by its attorneys and pursuant to Section 1.415 of the rules of the Federal Communications Commission (the "Commission"), hereby submits its comments in response to the Further Notice of Proposed Rulemaking ("FNPRM") which was released in the above-captioned proceeding on September 4, 1992.<sup>1</sup> HBO is one of the leading video programmers in the United States with approximately 23.6 million subscriptions to its "HBO" and "Cinemax" pay program services.

HBO supports the Commission's efforts to develop and provide spectrum for PCS and other important new telecommunications technologies, and it recognizes the need to

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<sup>1</sup> *In the Matter of Redevelopment of Spectrum to Encourage Innovation in the Use of New Telecommunications Technologies ("Redevelopment of Spectrum")*, 7 F.C.C.Rcd 6100 (1992). The Commission extended the date on which comments are due to December 11, 1992. Redevelopment of Spectrum, DA 92-1599, November 24, 1992.

make available the 2 GHz band to accommodate these new and innovative developments. In order to achieve these intended results, it is essential that suitable spectrum be provided for those currently using the 2 GHz band, i.e., terrestrial microwave services, who may need to be relocated. The Commission has proposed that some of the displaced microwave users be relocated to the C-Band and share frequencies with the existing users -- i.e., terrestrial microwave common carriers and fixed satellites. HBO does not oppose the proposed sharing arrangement as long as new users of the C-Band are subject to the current microwave channelization plans which have been in effect for decades and have proven to be effective among the current users of the C-Band.

The Commission's proposal to rechannelize the C-Band as set forth in the FNPRM, however, will disrupt the services of both the existing microwave users and the fixed satellite users, especially the 3.5-3.8 million home TVRO users,<sup>2</sup> who have been able to successfully share, on a co-primary basis, the spectrum of the C-Band through coordination and other efforts. The proposed rechannelization essentially could eliminate the use of four (4) satellite transponders and could cause irreparable interference to every transponder in the Downlink. With respect to the entire C-Band, rechannelization could permit relocation

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<sup>2</sup> Comments of the Satellite Broadcasting and Communications Association, *In the Matter of National Telecommunications and Information Administration Notice of Inquiry regarding the Current and Future Requirements for the Use of Radio Frequencies in the United States*, Docket No. 920532-2132, filed November 2, 1992 ("SBCA Comments").

of all potential 2 GHz microwave users to the C-Band, and thus, place an inequitable burden of coordination and adjustment on the current users of the C-Band.

I. INTEREST OF HBO

HBO is a major user of domestic C-Band communications satellites, employing on a full-time basis ten (10) C-Band satellite transponders. HBO provides satellite transmissions at C-Band of two time zone feeds of each of its major pay television program networks, "HBO" and "Cinemax".<sup>3</sup>

Since August 1991, HBO has been testing a new concept for its pay television program services, called multiplexing. Multiplexing involves the offering of multiple schedules of the "HBO" and "Cinemax" services and transmitting different programming schedules on different transponders simultaneously. The initial response to multiplexing from subscribers has been overwhelmingly favorable and HBO has moved the concept from the test phase to a nationwide offering, particularly for TVRO subscribers.

In addition to the "HBO" and "Cinemax" program services, HBO, either directly or through affiliated companies, has

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<sup>3</sup> As noted above, HBO currently has approximately 23.6 million subscriptions to its "HBO" and "Cinemax" program services. Most of the subscription services are provided through HBO's cable television and other affiliates. To receive the "HBO" and "Cinemax" services from C-Band satellites, HBO's affiliates employ approximately 18,000 satellite antennas. Included in the total number of subscriptions above are several hundred thousand "HBO" and "Cinemax" subscribers served by direct-to-home C-Band satellite reception equipment.

interests in several other cable television program services that are distributed via C-Band satellites, including Comedy Central, Black Entertainment Television and E! Entertainment.

## II. BACKGROUND

### A. Current C-Band Users

From the late 1940's and early 1950's to the present, the terrestrial microwave users of the C-Band have been predominantly common carriers which typically use the C-Band frequencies to provide video or other long-haul, high capacity services. Among these common carriers are AT&T, the seven regional Bell Operating Companies, US Sprint and MCI. Using the C-Band microwave frequencies, these carriers have built and operate an integrated network serving all parts of the country.

In the late 1960's and early 1970's, the fixed satellite services were also authorized to use spectrum in the C-Band.<sup>4</sup> This shared use by terrestrial microwave and fixed satellite providers has required considerable coordination and other efforts over the years to avoid harmful interference between the two services.

The C-Band is the backbone of video program distribution in the United States. The program networks that developed initially to serve the cable industry now number more than 70

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<sup>4</sup> *In the Matter of Amendments of Parts 21 and 25 of the Commission's Rules to provide for the shared use of the frequency bands 3700-4200, 5925-6425, 7250-7750 and 7900-8400 MHz by the Fixed, Mobile and Communications-Satellite Services, 5 RR 2d 1637 (1965) ("Shared Use of Frequency Bands")*.

and employ more than 100 C-Band satellite transponders. HBO alone reaches more than 12,000 cable headend facilities and approximately 6,000 other commercial distribution sites. A wide variety of video programming delivered by C-Band satellites is available to approximately 56.5 million cable subscribers in the United States.<sup>5</sup>

In addition, the direct-to-home satellite, or TVRO, industry relies almost exclusively on C-Band satellites for delivery of its video programming. The TVRO industry has grown at a rapid pace over the past decade. HBO estimates that there are currently 3.5-3.8 million homes equipped to receive C-Band satellite signals,<sup>6</sup> and the current growth rate, based on the sales of home satellite receiving equipment, is about thirty to thirty-five thousand (30,000-35,000) homes per month.<sup>7</sup> The TVRO industry provides substantial diversity and choice in video program services to persons, many of whom are outside the reach of cable systems or other multi-channel program distributors.<sup>8</sup>

The broadcast networks recently have increased their planned use of C-Band satellites. For example, CBS has purchased ten (10) C-Band transponders on the Galaxy IV and VII

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<sup>5</sup> Cable Television Developments, October, 1992, p. 1-A.

<sup>6</sup> SBCA Comments at 6.

<sup>7</sup> Satellite Broadcasting and Communications Association, *Satellite TV Facts at a Glance*, October, 1992.

<sup>8</sup> Many satellite education networks also rely on C-Band satellites to distribute their programming. See generally, Dr. Kathleen Hansell, "Satellite Education Networks -- Growing and Changing," *Via Satellite*, November, 1992, pp. 32-33.

satellites licensed to Hughes Communications Galaxy, Inc. CBS's use of these transponders will include newsgathering, business and educational traffic.<sup>9</sup> Furthermore, almost every broadcast radio station in the United States receives programming via C-Band satellites.<sup>10</sup>

B. The Commission's Proposed Rechannelization

In its FNPRM, the Commission proposes to "reallocate five bands above 3 GHz to private and common carrier microwave use on a co-primary basis and to prescribe additional technical standards to govern use of these bands."<sup>11</sup> The C-Band accounts for two of these five bands, i.e., the Downlink and the Uplink.

The Commission has proposed separate rechannelization plans for the Downlink and for the Uplink.<sup>12</sup> The proposed plan for the Downlink would rechannelize the twelve existing 20 MHz channel pairs into twenty-four channel pairs of 400 kHz bandwidth, twelve channel pairs of 800 kHz bandwidth, twenty-four channel pairs of 1.6 MHz bandwidth, twelve channel pairs of 3.2 MHz bandwidth, six channel pairs of 5 MHz bandwidth, twenty-five channel pairs of 10 MHz bandwidth and twelve channel pairs of 20 MHz bandwidth.<sup>13</sup> Specifically, this proposed frequency

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<sup>9</sup> Peter Lambert, "Satellites: The Next Generation," *Broadcasting*, July 27, 1992, p. 56.

<sup>10</sup> SBCA Comments at 10.

<sup>11</sup> Redevelopment of Spectrum, 7 F.C.C.Rcd at 6100 and 6103-04.

<sup>12</sup> The Commission's proposed rechannelizations are based on the proposals made by Alcatel Network Systems, Inc. ("Alcatel") in its petition for rulemaking (RM-8004).

<sup>13</sup> Redevelopment of Spectrum, 7 F.C.C.Rcd at 6102.

plan will create smaller bandwidth channel pairs in the lower and upper 40 MHz of the Downlink and channel pairs of 10 MHz bandwidth across the entire Downlink.<sup>14</sup>

The proposed plans for common carriers in the Uplink would rechannelize the eight existing 29.65 MHz channel pairs into twenty-four channel pairs of 400 kHz bandwidth, twelve channel pairs of 800 kHz bandwidth, forty-two channel pairs of 1.6 MHz bandwidth, twenty channel pairs of 3.2 MHz bandwidth, twelve channel pairs of 5 MHz bandwidth, twenty-four channel pairs of 10 MHz bandwidth and eight channel pairs of 30 MHz bandwidth.<sup>15</sup> As a result of the proposed rechannelizations, there would be many more terrestrial microwave operators in the entire C-Band, using narrower channels at different center frequencies, than is presently the case.

### III. THE CURRENT C-BAND CHANNELIZATION HAS SERVED EXISTING USERS WELL

As discussed above, the C-Band is currently shared on a co-primary basis by the fixed satellite services and terrestrial microwave services. According to the attached Technical Discussion by Norman Weinhouse ("Technical Discussion"), the terrestrial services are dominated by common carriers with

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<sup>14</sup> See proposed rule Section 21.701(d), Redevelopment of Spectrum, 7 F.C.C.Rcd at 6116-20.

<sup>15</sup> Redevelopment of Spectrum, 7 F.C.C.Rcd at 6102. The proposed plan for private carriers in the Uplink would rechannelize the existing channel pairs into twelve channel pairs of 400 kHz bandwidth, six channel pairs of 800 kHz bandwidth, forty-five channel pairs of 1.6 MHz bandwidth, fifteen channel pairs of 5 MHz bandwidth and sixteen channel pairs of 10 MHz bandwidth. Id.

requirements for long-haul, high-capacity channels of communications.<sup>16</sup> Due to these specific requirements, terrestrial services generally use the maximum channel capacity permissible under the Commission's rules, namely 20 and 30 MHz.<sup>17</sup>

The C-Band fixed satellite services have developed a de facto channelization whereby each transponder has a bandwidth of 36 MHz with 4 MHz guardbands. The center frequency for each transponder channel is 20 MHz from the center frequency of the adjacent channels, and, in compliance with the Commission's frequency reuse policy,<sup>18</sup> the even numbered transponder channels are orthogonally polarized with respect to the odd numbered channels.

As the Commission anticipated when the sharing relationship between satellite and terrestrial services first began,<sup>19</sup> both services have found coordination and other techniques necessary to avoid harmful interference. To date, the techniques employed by both services have proven successful, and both services have made efficient use of the C-Band in part due to such technical advancements as full frequency reuse and digital transmission.

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<sup>16</sup> Technical Discussion at 1.

<sup>17</sup> See 47 C.F.R. §§ 21.703 and 21.804 (1991).

<sup>18</sup> *In the Matter of Licensing of Space Stations in the Domestic Fixed-Satellite Service and Related Revisions of Part 25 of the Rules and Regulations*, CC Docket No. 81-704, 54 RR 2d 577 (1983), modified on recon., 99 F.C.C.2d 737 (1985) ("Licensing of Space Stations").

<sup>19</sup> Shared Use of Frequency Bands, 5 RR 2d 1637, 1645 (1965).

Generally there are three techniques used by Downlink satellite antenna users to avoid interference with terrestrial microwave services: (1) the directional nature of the antenna; (2) shielding and (3) filtering.<sup>20</sup> While directivity and shielding have proven to be of limited success in reducing the terrestrial microwave interference experienced by Downlink earth stations,<sup>21</sup> TI filters have proven enormously successful. TI filters have proven to be the only consistent and cost-effective method for successfully eliminating terrestrial microwave interference. Because TI filters reduce the level of interference by a significant amount, approximately 30 dB, they are effective in eliminating terrestrial interference in almost all cases.<sup>22</sup> A significant portion of the TVROs employed by individual consumers of direct-to-home services utilize TI filters to reduce and filter away harmful terrestrial interference.<sup>23</sup>

The success of TI filters, however, is directly dependent on the frequency plan developed by the terrestrial and satellite services. TI filters essentially eliminate that portion of a

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<sup>20</sup> The large number of terrestrial and satellite service providers in the C-Band has substantially limited the success of coordination efforts and has made it difficult to find suitable locations that are free of interference. In addition, home TVRO owners face limited options for locating their satellite antennas because the antennas generally must be placed wherever the homeowner lives.

<sup>21</sup> Technical Discussion at 3-4. Experience has shown that less than half of the TVRO's can be successfully shielded. Id. at 4.

<sup>22</sup> Id. at 5.

<sup>23</sup> Id.

transponder's bandwidth which overlaps the bandwidth used by the source of interference.<sup>24</sup> Under the current channelization of terrestrial microwave services, the center frequencies of terrestrial interference are always 10 MHz from the center frequencies of the Downlink satellite transponders. Therefore, the TI filters presently in operation are designed so that they filter out a bandwidth which is centered 10 MHz from the center frequencies of the Downlink satellite transponders. Because TI filters have been designed based on the current terrestrial microwave frequency plan, TI filters are dependent on this frequency plan.

TI filters, however, must be designed in a way that they filter out the interference without eliminating so much of the transponder's usable bandwidth that picture quality becomes unacceptable. When the source of interference is centered 10 MHz from the center frequency of the transponder, TI filters permit the satellite receiver to receive a substantial portion of the television signal, relatively free of interference. Moreover, the quality of the video signal remains acceptable with only a very slight loss of resolution and a washout of color content which can be restored by adjusting the television set.<sup>25</sup>

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<sup>24</sup> Id. at 5 and Figure 3.

<sup>25</sup> Id. at 5.

IV. THE PROPOSED CHANNELIZATION COULD CAUSE HARMFUL INTERFERENCE AND SEVERE ECONOMIC INJURY TO THE EXISTING USERS OF THE C-BAND

The Commission's plan to rechannelize the C-Band will not only scatter an increased number of terrestrial sources of interference throughout the C-Band, it will also position these sources of interference at varying bandwidths from the center frequencies of the satellite transponders. No longer will terrestrial sources of interference be located in the frequency plan 10 MHz away from the center frequencies of the Downlink satellite transponders. Instead, for the two (2) transponders at each end of the Downlink, there will be considerable variety as to how far off the transponders' center frequencies the sources of interference will appear.<sup>26</sup> For all transponders in the Downlink, sources of terrestrial interference may appear 5 MHz away on each side of a transponder's center frequency. Therefore, rechannelization of the Downlink could render the television signal in four (4) transponders, sixteen percent (16%) of the presently available transponder capacity in that band, unusable and could cause irreparable interference to all the other transponders in the Downlink.<sup>27</sup>

In most circumstances, replacement of TI filters is not a viable solution to avoiding the interference that will be caused by the proposed rechannelization. Employing additional filters or filtering interference which is centered less than 10 MHz

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<sup>26</sup> Id. at 6.

<sup>27</sup> Id. See also, SBCA Comments at 20-21.

from a transponder's center frequency will most likely degrade picture quality to an unacceptable level.<sup>28</sup>

The owners of many earth stations will be severely and adversely impacted because the Commission's proposed rechannelization will subject C-Band earth stations to an increased number of sources of interference, while simultaneously dismantling the only cost-effective technique by which those earth stations can avoid terrestrial interference. Many home TVRO owners will face a complete loss of their investment in their satellite antenna and receiving equipment. The economic burden of dealing with the results of the Commission's proposed rechannelization would be devastating on the video distribution industry.

V. THE COMMISSION SHOULD MAINTAIN THE FREQUENCY PLAN CURRENTLY USED IN THE C-BAND TO EQUITABLY SPREAD THE DISPLACED 2 GHZ USERS AMONG THE AVAILABLE BANDS

While the earth stations operating in the Uplink and the non-TVRO earth stations operating in the Downlink are generally licensed, and therefore protected from harmful interference caused by displaced 2 GHz microwave users, such protection does not alleviate the obligation of and burden on existing users to coordinate with users relocating to the C-Band.<sup>29</sup> Coordination is part of doing business in the fixed satellite services, however, it can be a time consuming and expensive process. In addition, many C-Band uplink stations are large teleports which

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<sup>28</sup> Technical Discussion at 6.

<sup>29</sup> See 47 C.F.R. § 25.203 (1991).

use numerous frequencies and uplink to a large number of satellites. Thus, a large investment is made in the location of these teleports, generally found near major cities, and the relocation of the teleports is not easily or inexpensively accomplished.

The Commission's proposed rechannelization of the C-Band would permit all displaced 2 GHz microwave users to relocate to the C-Band with no incentive to relocate to the higher proposed bands. While HBO and the other providers of video programming in the C-Band do not object to sharing the C-Band and to coordinating with displaced 2 GHz microwave users, they should not be made to do so with every such user which could possibly relocate to the C-Band.<sup>30</sup> If more displaced 2 GHz users relocate to the C-Band than the other available bands, the current users of the C-Band will be inequitably burdened with coordination and other adjustments.

In order to spread displaced 2 GHz microwave users equitably throughout the five (5) available bands, the Commission should maintain the frequency plan currently used in the C-Band. If the Commission maintains the current C-Band frequency plan, any displaced users requiring 20 MHz channel capacity may relocate to the C-Band, and the current users of the C-Band will not be unfairly burdened relative to the current users in the other available bands.

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<sup>30</sup> The Satellite Broadcasting and Communications Association estimates that there are at least 23,000 2 GHz microwave transmission links which could be relocated to the proposed bands above 3 GHz. SBCA Comments at 19-20.

VI. ADOPTION OF THE PROPOSED CHANNELIZATION WOULD BE CONTRARY TO COMMISSION POLICY

When facing the issue of reallocation of spectrum in the past, the Commission has given serious attention to minimizing the disruption and impact of such reallocation on the existing users in that spectrum.<sup>31</sup> Consistent with this practice, the Commission has specifically stated that the frequencies above 3 GHz will not be reallocated pursuant to this rulemaking so as to impose undue hardships on the existing users in those frequency bands.<sup>32</sup> If the Commission adopts its proposed rechannelization for the C-Band, it will have done exactly what it said it would not do.

As demonstrated above and in the attached Technical Discussion, the existing satellite users of the C-Band will suffer undue hardship if the Commission's proposed rechannelization plans are adopted. The services provided by the satellite TVRO industry will be subject to severe disruption and irreparable interference. Rectifying the interference to

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<sup>31</sup> See *In the Matter of Inquiry into the Development of Regulatory Policy in Regard to Direct Broadcast Satellites for the Period following the 1983 Regional Administrative Radio Conference, Report and Order*, 90 F.C.C.2d 676, 699-704 (1982), aff'd in part, vacated in part, *National Association of Broadcasters v. FCC*, 740 F.2d 1190 (D.C. Cir. 1984). See also, *In the Matter of Amendment of the Commission's Rules to Establish New Personal Communication Services, Notice of Proposed Rulemaking and Tentative Decision*, 7 F.C.C.Rcd 5676, 5718 (1992); Redevelopment of Spectrum, Notice of Proposed Rulemaking, 7 F.C.C.Rcd 1543, 1543 (1992); *Creating New Technology Bands for Emerging Telecommunications Technology*, OET/TS 92-1, January, 1992.

<sup>32</sup> Redevelopment of Spectrum, 7 F.C.C.Rcd at 6103.

the video distribution industry, to the extent possible, will be an enormous burden on the industry and its consumers.

Since the Commission's first authorization of domestic communications satellites, the Commission has fostered a policy of encouraging the development of communications services in the C-Band. The Commission has deregulated the sale and leasing of satellite transponders,<sup>33</sup> deregulated use of home satellite TVROs and other receive-only antennas<sup>34</sup> and, through regulatory abstinence, has promoted the commercial viability of video program delivery by permitting a marketplace approach to satellite scrambling.<sup>35</sup>

The harmful interference and the economic injury which will result from the rechannelization proposed in the FNPRM will end this long-standing policy and erode the prior efforts of the Commission and industry to develop and employ new services using the C-Band frequencies. The investments in many TVRO systems will be lost, and the growth in TVRO subscriptions will be stifled. Moreover, many of the efforts to coordinate with terrestrial microwave users will be rendered obsolete.

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<sup>33</sup> See *Domestic Fixed-Satellite Transponder Sales, Memorandum Opinion, Order and Authorization*, 90 F.C.C.2d 1238 (1982), aff'd sub nom. World Communications, Inc. v. FCC, 735 F.2d 1465 (D.C. Cir. 1984).

<sup>34</sup> See *Deregulation of Receive-Only Earth Stations*, 74 F.C.C.2d 205 (1979).

<sup>35</sup> See *In the Matter of Inquiry into the Scrambling of Satellite Television Signals and Access to those Signals by Owners of Home Satellite Dish Antennas ("Scrambling")*, Report, 2 F.C.C.Rcd 1669 (1987); *Scrambling, Second Report*, General Docket No. 86-336, FCC 88-67, March 11, 1988.

CONCLUSION

For the foregoing reasons, the Commission should not adopt the rechannelization plan proposed in its FNPRM. Instead, the Commission should permit relocation of 2 GHz terrestrial microwave users to the C-Band, but should also maintain the frequency plan currently in use in the C-Band and restrict such relocation to those 2 GHz users that require at least 20 MHz channel capacity.

Respectfully submitted,

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ATTACHMENT  
TO HBO COMMENTS  
TECHNICAL DISCUSSION

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## 1 FOUR (4) GIGAHERTZ FREQUENCY PLANS

De-Facto standard frequency plans have evolved for both terrestrial and satellite use in the 3700 to 4200 MHz band. Both services share this band on a co-equal basis. Figure 1 graphically illustrates a portion of the 3700-4200 band and how the center frequency of each are interleaved. It should be noted that the separation between terrestrial carriers and satellite carriers is always 10 MHz in a fully-developed situation.

### 1.1 Terrestrial Plan

The 3700 to 4200 MHz band has been used by the common carriers for long-haul, high density traffic utilizing hardware and designs of the highest quality and performance specifications. A cross-country network was established using this band in the late 1940's and early 1950's. This frequency band continues to be used by AT & T and the Regional Bell Operating Companies. Several other networks also use this band (Sprint, MCI, CPI and others).

Part 21 of CFR 47 (Domestic Public Fixed Radio Service) was enacted by the Commission. A frequency plan was not included in the rules promulgated thereunder, but the rules do provide that emission by a carrier is limited to 20 MHz, occupied

bandwidth, and calls for control of emissions outside this occupied band. The frequency plan adopted was the TD plan<sup>1</sup>. Over the years, the TD plan has been used by all common carriers, and has been implemented by all equipment manufacturers. As illustrated in Figure 1, it is characterized on any link by carriers spaced 20 MHz apart. Adjacent carriers are cross polarized.

### 1.2 Satellite Plan

The 3700 to 4200 MHz band is used in the U.S. Domestic Satellite Service for the Space to Earth (Downlink) at C Band. A de-facto standard frequency plan has evolved although it is not codified in the Commissions' Rules (Part 25, CFR 47). The plan is characterized as having 12 channels on two linear (orthogonal) polarizations. The center frequency of the channels are spaced 40 MHz apart on each polarization, and 20 MHz apart on opposite polarizations. Figure 1 shows a portion of the band and illustrates how the channels are interleaved with the terrestrial plan. Each satellite channel has a usable bandwidth of 36 MHz.

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<sup>1</sup> The "TD" designation corresponds to the model number designation given by Western Electric. Later, the plan was endorsed by the CCIR.

Television transmission utilizing frequency modulation (FM) represents the dominant use of the available satellite channels. Cable TV networks, broadcast TV networks, and private TV networks have been established as well as many educational networks at C Band. Each network generally lives in harmony with the terrestrial network without harmful interference to the other.

## 2 TVRO INDUSTRY

The TVRO industry, has become a valuable service to homes, schools, and business activities. The TVRO industry has been extremely innovative and has contributed many performance enhancements and cost savings to Low Noise Amplifiers and receivers mainly due to economies of large scale production. In this discussion I will describe how the TVRO industry also has managed to cope with the potential interference from terrestrial sources.

### 2.1 Antenna Discrimination

The first line of defense of a TVRO earth station is the directivity of the antennas used. In most cases this is not adequate to eliminate interference even though the antennas used meet the Commission's requirement for sidelobe gain (CFR 47, 25.209).