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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Donna R. Searcy, Secretary
Federal Communications Commission
1919 M Street, N.W.
Room 222
Washington, D.C. 20554

92-91

Re: Written Ex Parte Filing of TeleSciences, Inc.,
Harris Corporation - Farinon Division, and
Digital Microwave Corporation

Dear Ms. Secretary:

On behalf of TeleSciences, Inc., Harris Corporation -
Farinon Division, and Digital Microwave Corporation and in
compliance with Section 1.1206(a)(2) of the Commission's rules,
47 C.F.R. § 1.1206(a)(2), I am submitting the enclosed
correspondence and two copies, as a written ex parte filing for
inclusion in Docket No. ET 92-9.

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

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

In the Matter of)

Redevelopment of Spectrum to Encourage)
Innovation in the Use of New)
Telecommunications Technologies)

ET Docket No. 92-9

**EX PARTE REPLY COMMENTS OF TELESCIENCES, INC.,
HARRIS CORPORATION-FARINON DIVISION AND
DIGITAL MICROWAVE CORPORATION**

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Dated: April 7, 1993

TABLE OF CONTENTS

SUMMARY i

I. ADOPTION OF THE ALCATEL PLAN WILL DIMINISH PATH RELIABILITY, INCREASE THE COST OF RELOCATING 2 GHZ USERS AND REDUCE THE NUMBER OF CHANNELS AVAILABLE TO 10 GHZ USERS 4

A. The Unnecessarily Strict Spectral Efficiency Standard Proposed by Alcatel Will Degrade System Performance and Require Users to Resort to Costly Equipment Solutions for Narrowband Channels: Any Advantage is Outweighed by the Disadvantages. 5

B. Adoption of the Alcatel Plan Will Render a Substantial Majority of Existing 2 GHz Equipment Obsolete and Substantially Increase the Cost of Relocating 2 GHz Users. 7

C. Adoption of Alcatel's Plan Will Reduce the Number of Channels Available to Users in the 10 GHz Band. 9

II. THE TIA PLAN MEETS USER DEMAND FOR THE WIDEST POSSIBLE SELECTION OF EQUIPMENT 11

III. THE ALCATEL PLAN IS INCONSISTENT WITH INTERNATIONAL CHANNELIZATION PLANS. 13

IV. CONCLUSION 14

SUMMARY

Telesciences, Inc., Harris Corporation-Farion Division and Digital Microwave Corporation (collectively "Joint Commenters") submit these limited ex parte reply comments to respond to numerous factual statements and arguments raised for the first time in reply comments submitted by Alcatel Network Systems, Inc. in ET Docket 92-9 regarding the relative merits of Alcatel proposed channelization plan and technical rules for the 4, 6, 10 and 11 GHz emerging technologies "relocation" bands. Specifically, these ex parte reply comments evaluate the 1.6 MHz-based channel plan submitted by Alcatel ("Alcatel Plan") as compared to the alternative 1.25 MHz-based channel plan proposed by the Joint Commenters and the Fixed Point-to-Point Microwave Committee of the Telecommunications Industry Association ("TIA Plan") from the perspective of microwave equipment users.

As demonstrated herein, from both the user and the equipment manufacturer perspective, the significant disadvantages of Alcatel's 1.6 MHz-based channel plan far outweigh its advantages for low capacity 4 and 8 DS-1 radios. Contrary to the Commission's public interest objectives in this proceeding, the Alcatel Plan includes an unduly strict spectral efficiency proposal that will, if adopted, degrade system performance (*i.e.*, path

comparable, the Commission should select a channelization plan that will ensure continued vigorous competition in the microwave equipment market.

Uniquely, with regard to the 10 GHz band, in contrast to the other bands above 2 GHz, Alcatel proposes that the Commission both retain the existing 3.75 MHz plan and adopt an alternative proposed 1.6 MHz-based channel plan. The Joint Commenters believe that this dual channel plan proposal is impractical, unworkable and will effectively eliminate the existing 3.75 MHz-based channel plan. Moreover, adoption of Alcatel's proposal will reduce the number of available channels in the 10 GHz band to the detriment of the significant number of 2 GHz users that will be required to relocate in order to clear spectrum for emerging technologies, such as PCS.

Accordingly, the Joint Commenters urge the Commission to adopt the proposed TIA 1.25 MHz-based channel plan for the 4, 6, 10 and 11 GHz bands as it will best accommodate user needs as well as further the public interest in maintaining a competitive

These ex parte reply comments demonstrate that Alcatel's Plan fails with respect to each of these user needs. The Joint Commenters also attach as Appendix A. a point-by-point

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**EX PARTE REPLY COMMENTS OF TELESCIENCES, INC.,
HARRIS CORPORATION-FARINON DIVISION AND
DIGITAL MICROWAVE CORPORATION**

TeleSciences, Inc., Harris Corporation-Farinon Division and Digital Microwave Corporation (collectively "Joint Commenters"), by their undersigned counsel, hereby submit these limited ex parte reply comments^{1/} on the Commission's Further Notice of Proposed Rulemaking in the above-captioned proceeding.^{2/}

The Joint Commenters submit these limited ex parte reply comments to respond to numerous factual statements and arguments raised for the first time in reply comments

^{1/} These written ex parte reply comments are being filed in accordance with Section 1.1206(a) of the Commission's Rules, 47 C.F.R. § 1.1206(a) (1992). Pursuant to that rule, the Joint Commenters submit two copies to the Secretary's office for inclusion in the public record.

^{2/} *Redevelopment of Spectrum to Encourage Innovation in the Use of New Telecommunications Technologies, Further Notice of Proposed Rulemaking*, 7 FCC Rcd. 1542 (1992). The Commission's Further Notice in this proceeding incorporates much of the channelization plan and technical requirements initially proposed by Alcatel Network Systems, Inc., with certain modifications. For convenience, these ex parte reply comments herein refer to the proposal set forth in the Commission's Further Notice as the "Alcatel Plan."

submitted by Alcatel Network Systems, Inc. ("Alcatel" or "ANS"). Specifically, the Joint Commenters herein respond to Alcatel's criticism in its reply comments of the modified channelization plan and technical rules for the 4, 6, 10 and 11 GHz band submitted by the Joint Commenters and the Fixed Point-to-Point Microwave Committee of the Telecommunications Industry Association ("TIA") in the initial comments in this proceeding.^{3/} See Appendix B, Figure 1 detailing basic differences between the Alcatel Plan and the TIA Plan. Although the channel plans submitted by Alcatel and TIA agree in many respects, with regard to low capacity radios (*i.e.* 4 DS-1 and 8 DS-1 radios), the TIA proposal to establish a 1.25 MHz-based channelization plan best serves the Commission's goals and the public

^{3/} In their comments, the Joint Commenters and the TIA proposed a detailed 1.25 MHz-based alternative channelization plan for the 4, 6, 10 and 11 GHz bands designed to accommodate the technical needs of 2 GHz users, minimize the cost of relocation by allowing the maximum reuse of 2 GHz baseband equipment, provide a balance of wideband and narrowband channels, maximize spectrum utilization and efficiency, hasten the introduction of PCS, and promote competition in the equipment market. In their Reply Comments, the Joint Commenters and the TIA modified their proposals to reflect the industry consensus that the 29.652 MHz band spacing in the lower 6 GHz band best serves the public interest. Because the plans submitted by the Joint Commenters and the TIA are essentially identical, for convenience, these *ex parte* reply comments refer collectively to the two plans as the "TIA Plan."

interest.^{4/} See Appendix B, Figure 2 detailing the numerous user benefits of the TIA Plan.

Specifically, the TIA Plan ensures that:

- users' narrowband low capacity needs can be met cost effectively while satisfying reasonable spectral efficiency standards. Alcatel's unduly strict spectral efficiency requirements unnecessarily degrades system performance and increases user costs;
- users can reuse much of their current 2 GHz equipment without sacrificing the goal of efficient spectrum utilization. The 1.6 MHz plan proposed by Alcatel would render obsolete a

Further, to assist the Commission in evaluating Alcatel's voluminous Reply Comments, the Joint Commenters provide in the attached Appendix A, a point-by-point analysis of arguments advanced in Alcatel's Reply Comments.

I. ADOPTION OF THE ALCATEL PLAN WILL DIMINISH PATH RELIABILITY, INCREASE THE COST OF RELOCATING 2 GHZ USERS AND REDUCE THE NUMBER OF CHANNELS AVAILABLE TO 10 GHZ USERS

As detailed in Appendix B, Figure 1, the key differences between the Alcatel Plan and the TIA Plan involve: 1) channel bandwidths (the Alcatel Plan proposes 1.6 MHz-based channels for 4 and 8 DS1 radios and the TIA Plan proposes 1.25 MHz-based channels for 4 and 8 DS-1 radios); and 2) spectral efficiency standards (the Alcatel Plan proposes 3.86 B/Hz efficiency using 64 QAM modulation as compared to the TIA Plan's 2.98 B/Hz using 16 QAM modulation). The Joint Commenters submit that in both respects -- channel bandwidths and spectral efficiency -- the TIA Plan best accommodates user needs for reasonably priced, spectrally efficient equipment.

A. *The Unnecessarily Strict Spectral Efficiency Standard Proposed by Alcatel Will Degrade System Performance and Require Users to Resort to Costly Equipment Solutions for Narrowband Channels: Any Advantage is Outweighed by the Disadvantages.*

The TIA Plan proposes flexible spectral efficiency standards that incorporate an "economic mechanism" as a driving force for applicants to use only the necessary amount of spectrum. In contrast, Alcatel proposes an impractical standard that will not benefit users.

Although Alcatel highlights the spectral efficiency features of its plan as a key asset, any advantage of Alcatel's proposed spectral efficiency requirements are far outweighed by their disadvantages. Specifically, the spectral efficiency standards imposed by the Alcatel Plan for narrowband equipment are not practical because they would require manufacturers to incorporate more complex, costly components and technology into narrowband radios than is necessary to meet the low capacity needs of most users. Because the Alcatel Plan requires that 4 DS-1's fit into 1.6 MHz of spectrum, radios must be engineered to incorporate relatively expensive 64 QAM modulation technology which will significantly increase system costs. The TIA Plan includes a more practical and realistic spectral efficiency standard that permits users to meet their low capacity needs with radios that incorporate less expensive 16 QAM modulation technology and yet are all still spectrum efficient.

Significantly, Alcatel's high spectral efficiency standard will also increase user costs by compelling users to install larger antennas and in most cases additional equipment to their systems in order to achieve acceptable path reliability levels. Generally, as the modulation scheme increases, the system gain of the radio decreases and path reliability is

diminished. Accordingly, because Alcatel's narrowband low capacity radio uses 64 QAM modulation, it will experience receiver threshold penalties that degrade system gain and system reliability. See Appendix B, Figure 3 illustrating that users can achieve 25% better path reliability under the TIA Plan. (The Joint Commenters estimate that users will suffer 400% more system downtime under the Alcatel Plan.) Users who face these penalties can attempt to mitigate their impact and achieve path reliability comparable to that available using a 16 QAM radio by three methods -- 1) increasing antenna size, 2) adding repeater stations, 3) or using higher output power amplifiers -- each of which increases the cost of relocating a displaced 2 GHz user or initiating a new system.

The Joint Commenters estimate that, to achieve path reliability comparable to a 16 QAM low capacity radio with a 64 QAM radio, under the first method stated above, a user will be required to invest an additional \$5080 to \$29,120 in antennas depending on the size of the antenna (these dollar estimates do not include costs associated with tower stiffening). See Appendix B, Figure 4 detailing the increased costs that users will be required to incur under the Alcatel Plan. Further, even with increased antenna size it still may not be possible to achieve path reliability and maintain system availability comparable to a 16 QAM low capacity radio. To compensate for the decreased system gain, users may need to install additional repeaters, particularly on marginal hops at a cost of several hundred thousand dollars per repeater. Finally, system gain degradation may be compensated for by increasing the transmitter output power. Systems using 64 QAM modulation, however, would require an extremely high transmit power to achieve path reliability comparable to a 16 QAM low capacity radio (for equivalent error corrections and digital processing

techniques). The most effective method of achieving higher output power are to: (a) build high power amplifiers; or (b) combine the output of two low power amplifiers. Using either method, users can be expected to incur an additional cost of \$2,000 to \$12,000 per terminal based on the equipment design.

Thus, Alcatel's proposed spectral efficiency requirements for narrowband channels impose unnecessary cost burdens on users without a corresponding benefit. To achieve

building blocks. See Appendix B, Figure 7 illustrating that 2 GHz modems could be reused under the TIA Plan. Because the current FCC authorized bandwidth for 2 GHz low capacity radios is 3.5 MHz, the relatively large installed base of 2 GHz microwave equipment uses 3.5 MHz-based channels. As indicated in Figure 7, the TIA Plan accommodates the majority of users' existing 2 GHz equipment by proposing an authorized bandwidth of 3.75 MHz channels for low capacity digital radios in the upper bands. Using simple arithmetic, it is evident that the existing 3.5 MHz channel radios will fit into the 3.75 MHz channels proposed in the TIA Plan. Consequently, under the TIA Plan, the overall cost of system relocation would be reduced because operators of incumbent 2 GHz systems would have the ability to reuse 2 GHz modems and spare parts still being manufactured in the upper bands.

In contrast, because the standard 2 GHz 3.5 MHz bandwidth low capacity radios cannot fit into Alcatel's proposed 1.6 MHz bandwidth building blocks (producing narrow channel bandwidths of 1.6, 3.2 and 5 MHz) unless a full 5 MHz of spectrum is used for each 3.5 MHz channel radio, adoption of Alcatel's Plan would substantially decrease efficient use of the spectrum and result in significant spectrum waste (1.5 MHz per channel). Further, the cost of relocations would increase because only microwave users currently served by

C. Adoption of Alcatel's Plan Will Reduce the Number of Channels Available to Users in the 10 GHz Band

The Joint Commenters believe that Alcatel's proposal for a dual channel plan in the 10 GHz band would, if adopted, substantially reduce the number of channels available to users in the 10 GHz band. Because no manufacturer, including Alcatel currently manufactures 1.6 MHz equipment for the 10 GHz band, Alcatel proposes that the Commission authorize a dual channel plan for the 10 GHz band that (1) retains the existing 2.5/3.75 MHz channel plan for the 10 GHz band, and (2) permits equipment to follow a 1.6 MHz channel plan. Under this dual channel plan scheme, users could be licensed to use the 10 GHz band under either channel plan.

As illustrated in Appendix B, Figure 15, allowing users to select from two disparate channel plans (that divide available spectrum into different bandwidths) would necessarily create significant fallow spectrum remnants. One licensee's use of a channel based on

Commission is striving to accommodate the spectrum needs of all displaced 2 GHz users.

under an alternative 1.6 MHz plan, the Commission should adopt the spectral efficiency standard proposed by the TIA.

II. THE TIA PLAN MEETS USER DEMAND FOR THE WIDEST POSSIBLE SELECTION OF EQUIPMENT

One recurring theme echoed throughout the comments and reply comments of users participating in this proceeding is that the Commission should select a channelization plan that safeguards their interests in maintaining a diversity of suppliers.^{2/} McCaw Cellular states that the "Commission's adoption of channelization plans must take into account the realities of the equipment market and capabilities of manufacturers. Any plan adopted in the proceeding must be consistent with ensuring that microwave licensees (existing and new) will be able to obtain reasonably priced, quality equipment."^{3/} The American Petroleum Institute succinctly states its preference for "a channelization plan [on a basis] that permits competition among microwave equipment manufacturers since a robust market will best serve microwave users."^{4/}

The Joint Commenters emphasize that this user interest can best be met under the TIA Plan. As previously discussed, the TIA Plan's 1.25 MHz-based channelization scheme is consistent with the existing supply of microwave equipment now in operational use. The

^{2/} See generally, Reply Comments of the Utilities Telecommunications Council, ET Docket 92-9 at 5-7, Reply Comments of McCaw Cellular Communications, Inc. - ET Docket 92-9 at 3-4, Reply Comments of American Petroleum Institute - ET Docket 92-9 at 4.

^{3/} Reply Comments of McCaw Cellular Communications, Inc. ET Docket 92-9 at 4.

^{4/} Reply Comments of American Petroleum Institute ET Docket 92-9 (filed January 27, 1993) at 4.

Joint Commenters together serve approximately 70% of the existing 2 GHz microwave market. Alcatel and others serve the remaining 30% of the 2 GHz market. Alcatel is also the only manufacturer that currently produces equipment using the 1.6 MHz channel scheme. As illustrated in Appendix B, Figure 5, if the Alcatel 1.6 MHz Plan is adopted, users moving into the 6 GHz band (both upper and lower 6 GHz) would not have a choice among competitive microwave equipment suppliers. The market would offer only one vendor's radio to meet their 6 GHz needs.

In contrast, Appendix B, Figure 5 shows that under the TIA Plan (based on 1.25 MHz channels), users would have an immediate choice of at least three competing radios, with an additional three competing radios to be introduced in the next six to twelve months to meet their 6 GHz band low capacity needs. Alcatel's planned narrowband 6 GHz equipment would be accommodated in the TIA Plan without compromising common channel bandwidths for all bands below 12 GHz. In the 10 GHz band, users would have a selection of three competing suppliers of radios from which to meet their 10 GHz needs.^{10/} See Appendix B, Figure 5 illustrating that users would have a broader selection of equipment and a wider choice of suppliers under the TIA Plan.

^{10/} If the Commission decides to adopt a 1.6 MHz-based channelization plan for the 6 GHz band, based on their collective long-standing, practical industry and market experience, the Joint Commenters expect that they will face product development lead times of at least two years and requiring significant development funds to change their technologies to 1.6 MHz-based products. The Joint Commenters believe that this formidable competitive disadvantage would discourage vendors from introducing a new line of 1.6 MHz-based equipment.

III. THE ALCATEL PLAN IS INCONSISTENT WITH INTERNATIONAL CHANNELIZATION PLANS

Leading U.S. microwave equipment manufacturers have been working with international standards bodies to establish consistent worldwide frequency plans for several years. In recent years, the U.S. industry has made great strides towards such harmonization. For example, frequency plans based on 2.5 MHz (or 1.25 MHz building blocks) have been selected in both the U.S. and Canada for recently channelized digital bands such as the 10 and 18 GHz band. At the international level, CCIR^{11/} has recommended 2.5 MHz bands for six bands, including the 10, 15, 23, 27, 38, and 55 GHz bands. See Appendix B, Figure 9 listing 2.5 MHz channel plans recommended by CCIR. Discussions are also being held on the possibility of adopting a similar frequency plan for those 2 GHz bands that will remain fixed allocations in several outside the U.S.

The Joint Commenters are unaware of any country outside the U.S. that currently uses a 1.6 MHz-based channel plan. Consequently, adoption of a 1.6 MHz-based channel plan unique to the U.S. would retard the international harmonization process. As a result, the spectrum management flexibility and competitiveness sought by U.S. manufacturers would be compromised, U.S. microwave equipment prices would be kept unnecessarily high, and user choice would be limited.

^{11/} CCIR refers to the International Radio Consultive Committee of the International Telecommunications Union. The CCIR studies technical and operating questions concerning radio communications of all frequencies and issues recommendations with a view of standardizing telecommunications on a worldwide basis.

IV. CONCLUSION

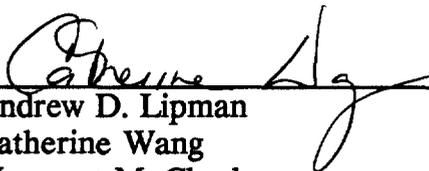
In addition to the technical merits of the TIA Plan outlined in previous filings, the Joint Commenters submit that the TIA Plan, as compared to the Alcatel Plan, best accommodates user needs:

- for sufficient narrowband and wideband channels in the 4, 6, 10, and 11 GHz bands;
- for reliable system performance and availability; and
- for competitively supplied, cost-effective and spectrally efficient microwave equipment from a diverse group of competitive vendors.

For these reasons, the Joint Commenters urge the Commission to adopt the TIA Plan for the 4, 6, 10, and 11 GHz frequency bands as the plan that best serves the public interest.^{11/}

Respectfully submitted,

**TELESCIENCES, INC., HARRIS CORPORATION-FARINON DIVISION, AND
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Dated: April 7, 1993



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114010.1

^{11/} The Joint Commenters' Technical Certification is attached.

TECHNICAL CERTIFICATION

I am responsible for my Company's microwave equipment products operating in the 2, 4, 6, 10 and 11 GHz frequency bands. I am an engineer by training and am familiar with the Commission's existing and proposed technical rules for microwave equipment operating in these frequencies. The engineering and technical information and representations contained in these Ex Parte reply comments, including all attachments and appendices, was prepared or compiled by me or under my supervision. I have reviewed this Ex Parte submission and certify that the engineering and technical information and representations contained therein are true, complete and accurate to the best of my knowledge.

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APPENDIX A

**JOINT COMMENTERS DETAILED ANALYSIS OF AND
RESPONSE TO ANS' REPLY COMMENTS AND TECHNICAL DOCUMENTATION**

As discussed in the Joint Commenters' Ex Parte Reply Comments, of which this Appendix is a part, the Joint Commenters believe that ANS' Reply Comments include certain erroneous technical information and inconsistencies regarding the channelization plans submitted by the Joint Commenters and TIA. Given that the Commission must rely on the public record in this proceeding to assess the relative merits of the ANS and TIA plans, the Joint Commenters provide below a point-by-point response to specific information and arguments submitted by ANS in its Reply Comments and supporting technical documentation.

The Joint Commenters have worked diligently to understand the specific needs of incumbent 2 GHz users relocating to the designated bands and new users initiating service in the designated bands. In order to develop a plan that reasonably accommodates the diverse interest of users and other vendors (ANS), the Joint Commenters and the TIA have worked to compromise and modify the plan on many issues. However, the Joint Commenters believe that users and the competitive U.S. microwave industry will be severely disadvantaged if the FCC adopts the ANS plan as currently proposed. The Joint

Typically TIA comments are based on consensus reached within the manufacturing industry. The TIA comments do not represent a consensus - merely the unsubstantiated opinion of a majority of the TIA members. ANS is a member of TIA and has significant reservations regarding the long term viability of the TIA position. That position was noted on the cover page of the TIA comments." (Appendix B, p14/7, 15/1)

JC Response: Contrary to ANS' statement in Appendix B. 14/7, 15/1, there is a

IC Response: Contrary to ANS' conclusory statement, elimination of these channels is warranted. After careful research, the Joint Commenters determined that this band lay fallow and could therefore be rechannelized. In its reply comments in this Docket, Comsearch verifies that these channels are currently underutilized stating that "there are currently six pairs of 800 KHz frequencies and three pairs of 1.6 MHz frequencies allocated in the upper 6 GHz (6525 - 6875 MHz) band. A review of our database indicates that these frequencies are not used . . ." "The compelling public interest in avoiding unnecessary spectrum waste supports elimination of these channels." See Comsearch Reply Comments at (7/2) With regard to the remainder of the footnote, the Joint Commenters' note the errors and provide a revised channel plan. See Appendix C.

D. Channel Concatenation Does Not Serve the Public Interest in Avoiding Spectrum Waste.

ANS States: In the ENPRM, the Commission follows ANS' proposal for the use of concatenated frequency plans in which two or more adjacent channels are combined into a wider channel. This approach promotes flexibility in defining new channelization plans without requiring a lengthy petition process through the Commission.

Under this proposal, 400 KHz, 1.6 MHz, and 10 MHz channels would become basic building blocks for low, medium, and high capacity systems respectively." (39/3) See also ANS Technical Staff Reply Comments 25/1. "Figure 20 shows some concatenated frequency plans that would be acceptable to Alcatel. For high capacity systems, two 10 MHz channels could be combined into one 20 MHz channel."

IC Response: The Joint Commenters fervently oppose the concatenation of channels as contrary to the public interest goal of maximizing spectrum utilization. The Joint Commenters believe that channel concatenations can produce a myriad of channels such as 1.2, 2.0, 2.4, 2.8, 3.6, 4.0, 4.4, 4.8, 6.4, 8.0, and 9.6 MHz, just to name a few, that would produce splinter channels and create a significant amount of fallow spectrum. We urge the Commission to ban this practice and adopt a channel plan for all authorized bandwidths. See Appendix B, Figure 16 summarizing the TIA Plan's recommended rules.