

Before the
Federal Communications Commission
Washington DC 20554

In the Matter of)	
)	
Amendment of Part 101 of the)	
Commission's Rules to Facilitate the Use of)	WT Docket No. 10-153
Microwave for Wireless Backhaul and Other)	
Uses and to Provide Additional Flexibility to)	
Broadcast Auxiliary Service and Operational)	
Fixed Microwave Licensees)	
)	
Request for Interpretation of Section)	
101.141(a)(3) of the Commission's Rules)	WT Docket No. 09-106
Filed by Alcatel-Lucent, Inc., <i>et al.</i>)	
)	
Petition for Declaratory Ruling Filed by)	WT Docket No. 07-121
Wireless Strategies, Inc.)	
)	
Request for Temporary Waiver of Section)	
101.141(a)(3) of the Commission's Rules)	
Filed by Fixed Wireless Communications)	
Coalition)	

Comments of the Fixed Wireless Communications Coalition

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Comments of the Fixed Wireless Communications Coalition

The Fixed Wireless Communications Coalition (FWCC)¹ files these comments in the above-captioned proceeding.²

¹ The FWCC is a coalition of companies, associations, and individuals interested in the fixed service—*i.e.*, in terrestrial fixed microwave communications. Our membership includes manufacturers of microwave equipment, fixed microwave engineering firms, licensees of terrestrial fixed microwave systems and their associations, and communications service providers and their associations. The membership also includes railroads, public utilities, petroleum and pipeline entities, public safety agencies, cable TV providers, backhaul providers, and/or their respective associations, communications carriers, and telecommunications attorneys and engineers. Our members build, install, and use both licensed and unlicensed point-to-point, point-to-multipoint, and other fixed wireless systems, in frequency bands from 900 MHz to 95 GHz. For more information, see www.fwcc.us.

² *Use of Microwave for Wireless Backhaul and Other Uses*, WT Docket Nos. 10-153 *et al.*, Notice of Proposed Rulemaking and Notice of Inquiry, FCC 10-146 (released Aug. 5, 2010 (“*Notice*”).

I. SUMMARY

The FWCC agrees with the Commission that dramatic growth in demand for mobile broadband will drive a parallel demand for backhaul capacity. We commend the Commission for looking into solutions before the problems become urgent.

The *Notice* proposes extensive spectrum sharing among the Broadcast Auxiliary Service (BAS), the Cable Television Relay Service (CARS), and the Fixed Service. While the FWCC does not oppose these proposals, we note two potential problems.

Among the BAS users are TV pickup operators, such as those covering news events, who must do frequency coordination quickly, often by phone. The Fixed Service, by contrast, handles frequency coordination through a notify-and-response procedure that offers excellent assurance of interference-free operation. We question whether Fixed Service operators can maintain their present levels of reliability—often in excess of 99.9999 percent—in an environment shared with TV pickup units.

A second problem arises from the discrepant bandwidths used by the Fixed Service and by BAS and CARS. Because the band edges do not line up, an operator coordinating in one service will typically block two channels in another service. Depending on the specifics, this can waste 20 MHz to coordinate 30 MHz or, in some cases, waste 35 MHz to coordinate 25 MHz. These effects should ameliorate over the next several years, as new links are built to more consistent standards, but will continue to impair spectrum usage in the meantime.

We support elimination of the final link rule, but only if the Commission proceeds with Fixed Service sharing in BAS and CARS frequencies. Otherwise an imbalance in access to spectrum will result.

The FWCC strongly favors the adoption of rules allowing adaptive modulation—*i.e.*, bit rates lower than otherwise required, when needed temporarily to combat adverse atmospheric conditions. The judicious use of adaptive modulation can improve overall data throughput, keep critical traffic flowing when the link would otherwise fail, maintain network synchronization, and raise spectrum efficiency overall.

The original proponents of adaptive modulation suggested, among other conditions, that licensees be required to maintain the bit rate listed in the rules “on average.” The Commission tentatively rejected this standard, concerned that it might allow licensees to install inferior systems. We think it is worth a second look, and indeed, offers better safeguards against abuse than the alternatives.

The “on average” standard ensures that every system will achieve the spectrum efficiency required in the rules—if not at every instant, then over time. The standard also limits the fraction of time that a system can operate at low bit rates. While a system that ordinarily runs at faster data speeds can spend more time at slower modulations, yet still meet the average, the standard nonetheless satisfies the Commission’s minimum criterion for adequate spectrum efficiency overall. In practice, though, no system is likely to operate at low speeds any longer than necessary, as the marketplace tends to weed out inefficient products and providers.

The Commission’s alternative standard for adaptive modulation, allowing low bit rates during periods of “anomalous signal fading,” is difficult to define in ways that adequately guide system designers and operators. We think the “on average” standard will be easier to understand and apply in practice. It also eliminates any need for technical micromanagement, and makes it unnecessary to specify an absolute minimum bit rate.

We see no need for built-in restrictions in equipment, in view of the Fixed Service industry's excellent record of compliance with the Commission's technical rules, or for logging adaptive modulation events. We do, however, agree that applicants intending to use adaptive modulation should include the specifics in their prior coordination notices.

The FWCC favors easing spectrum efficiency requirements in rural areas, and permitting smaller antennas in areas where frequency congestion is not a problem. In both cases, we suggest provisions to make sure equipment performance can improve if conditions change.

To help develop more Fixed Service spectrum, the FWCC urges the Commission to pursue our pending suggestion for sharing the Federal fixed band at 7125-8500 MHz, and to reexamine the frequency coordination relationship between the Fixed Service and the Fixed Satellite Service.

The FWCC is on record as opposing the "auxiliary stations" proposal, and is filing a separate pleading on the topic.

II. NOTICE OF PROPOSED RULEMAKING ISSUES

A. ADDITIONAL SPECTRUM

The Commission proposes allowing Fixed Service operations in two bands currently allocated to the Broadcast Auxiliary Service (BAS) and the Cable Television Relay Service (CARS), collectively covering 6875-7125 MHz and 12.7-13.2 GHz.

While the FWCC does not directly oppose this sharing, we do have reservations, as set out below.

1. 6875-7125 MHz

This band is used for fixed point-to-point studio-transmitter links (STLs) and for mobile or temporary-fixed TV pickup operations. The band is currently channelized at 25 MHz.³

The Commission proposes to authorize Fixed Service operations in the band, allowing both BAS and Fixed Service operators to use bandwidths of 400 kHz, 800 kHz, 1.25 MHz, 2.5 MHz, 3.75 MHz, 5 MHz, 10 MHz, and 30 MHz.⁴ These are the same bandwidths as are authorized in the adjacent 6525-6875 MHz “Upper 6 GHz” Fixed Service band.

The FWCC foresees problems in frequency coordination with TV pickup operators. The Fixed Service relies on detailed frequency coordination typically conducted over a 30 day period (but sometimes accomplished on an expedited basis).⁵ The procedure gives incumbents excellent interference protection against newcomers to the band, and tells newcomers whether they can operate free of interference from incumbents. This enables Fixed Service operators in some applications routinely to achieve 99.9999% (“six nines”) availability, and sometimes higher.⁶ In contrast, TV pickup operators must go where the news is, and hence are allowed to coordinate immediately through a local coordinator.⁷ We question whether Fixed Service users can manage the reliability they need, while operating in the same band with TV pickup units.

³ 47 C.F.R. § 74.602(a).

⁴ 47 C.F.R. § 74.602(j) (tables) (proposed); 47 C.F.R. § 101.147(l) (tables) (proposed).

⁵ *See generally* 47 C.F.R. § 101.103.

⁶ An availability of 99.9999% corresponds to total outages of no more than 32 seconds per year. This is a remarkable level of reliability for equipment that operates outdoors and exposed to the weather.

⁷ 47 C.F.R. § 74.638.

Moreover, the discrepancy between the 25 MHz channels used in the BAS, and the 10 and 30 MHz channels that are typical in the Fixed Service, would result in additional coordination problems and large amounts of wasted spectrum. As shown in Figure 1, coordinating a single 30 MHz channel for Fixed Service use would block 50 MHz of BAS spectrum, wasting 20 MHz. Conversely (not shown), coordinating a single 25 MHz BAS channel will usually block two 30 MHz Fixed Service channels, wasting 35 MHz.

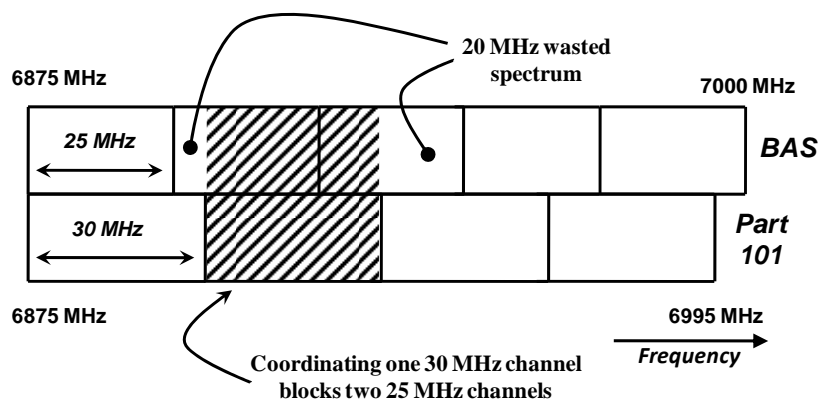


Figure 1: Discrepant Channel Sizes Waste Spectrum

We ask the Commission to consider the coordination difficulties and spectrum inefficiencies in its decision on sharing this band.⁸

2. 12.7-13.2 GHz

This band is used for BAS, channelized at 25 MHz,⁹ and for CARS, channelized at 6, 12.5, and 25 MHz.¹⁰

The Commission proposes to authorize Fixed Service operations in this band as well, and to allow both BAS and Fixed Service operators to use allow bandwidths of 1.25 MHz, 2.5 MHz,

⁸ If the Commission proceeds with its proposal to rechannelize BAS spectrum, the inefficiencies may arise anyway, as between BAS users.

⁹ 47 C.F.R. § 74.602(a) (table).

¹⁰ 47 C.F.R. § 78.18(a).

3.75 MHz, 5 MHz, 10 MHz, and 30 MHz.¹¹ (These are the same bandwidths are authorized in the nearby 11 GHz Fixed Service band.) The Commission proposes to leave the CARS bandwidths unchanged.¹²

The FWCC has questions about this sharing arrangement as well. Again, the discrepant channel widths between existing BAS/CARS facilities on the one hand, and Fixed Service practice on the other, would magnify the frequency coordination problems, and even when coordination is successful, would block large amounts of spectrum from productive use.

Unlike the 6875-7125 MHz band, where the Commission proposes an eventual changeover to a new channeling scheme for all services, the 12.7-13.2 GHz band will introduce the new channel plan for BAS while indefinitely continuing the existing 6, 12.5, 25 MHz arrangement for CARS. We think this plan may lead to ongoing problems in coordination and spectrum inefficiencies.

B. FINAL LINK RULE

Section 101.603(a)(7) provides:

Licenseses may transmit program material from one location to another, provided that the frequencies do not serve as the final RF link in the chain of distribution of the program material to broadcast stations[.]

The Commission proposes to drop this restriction on final RF links, on the general principle that reducing the restrictions on frequency usages promotes spectrum efficiency.¹³

The FWCC suggests the Commission tie this proposal to Fixed Service sharing in the BAS and CARS bands, discussed above. If the Commission proceeds to allow sharing in those

¹¹ 47 C.F.R. § 74.602(k) (tables) (proposed); 47 C.F.R. § 101.147(q) (tables) (proposed).

¹² *Notice* at ¶ 19 n.42

¹³ *Notice* at ¶ 25.

bands, as proposed, then it should be consistent and also abolish the final link rule. If, on the other hand, it leaves BAS and CARS spectrum closed to the Fixed Service, it should also preserve the final link rule. Abolishing the rule will allow final link services to increase the pressure on Fixed Service spectrum. That is workable only if the Fixed Service has the concomitant benefit of access to BAS and CARS frequencies.

In short, the Commission should effect both changes, or neither.

C. ADAPTIVE MODULATION

1. Advantages

The FWCC is among the original proponents of adaptive modulation.¹⁴ We believe the Commission should allow temporary drops below the minimum payload capacity specified in Section 101.141, for short periods when necessary to maintain an operational link.

The Notice well summarizes the advantages of this policy:

- data throughput better than the zero rate otherwise caused by a fade;
- continued handling of critical traffic when the link would otherwise cease to operate;
- maintenance of network synchronization—no need for a time-consuming reboot;
- improved spectrum efficiency overall.¹⁵

Allowing a temporarily low data rate *raises* the overall rate. A brief period of slow transmission, when necessary, makes better use of the spectrum than no communications at all.

¹⁴ Letter from Mitchell Lazarus on behalf of Alcatel-Lucent, Dragonwave Inc., Ericsson Inc., Exalt Communications, Fixed Wireless Communications Coalition, Harris Stratex Networks, and Motorola, Inc. to Marlene H. Dortch, Secretary, FCC, in WT Docket No. 09-106 (filed May 8, 2009) (“Request for Interpretation of Section 101.141(a)(3) of the Commission's Rules to Permit the Use of Adaptive Modulation Systems”).

¹⁵ Notice at ¶ 30.

2. *Standards*

The FWCC and its co-petitioners originally proposed three conditions for adaptive modulation:

- permitted only during brief periods when the link would otherwise be completely inoperative;
- links must comply with the minimum payload capacity in ordinary operation;
- links must maintain the minimum capacity on average.

The Commission has tentatively rejected the “on average” standard. It fears this approach would give licensees too much latitude to deploy systems that are inefficient or otherwise inconsistent with good engineering practices, and would make enforcement of Section 101.141 (on minimum payload capacity) more difficult.¹⁶

We respectfully ask the Commission to rethink this position.

Adoption of the “on average” requirement is a simple way to assure that the purpose of Section 101.141 is satisfied. Over time (if not every instant), links will have to meet the spectrum efficiency minima in the rule. The “on average” condition also has the advantages of being easy to understand and straightforward to apply.

None of the parties filing in WT Docket No. 09-106 objected to an “on average” requirement. Some specifically supported it.¹⁷

We do not agree that this standard creates excessive latitude for inefficient systems.

¹⁶ *Notice* at ¶ 38.

¹⁷ Reply Comments of Motorola, Inc. in WT Docket No. 09-106 at 5 (filed Aug. 11, 2009); Comments of Harris Stratex Networks, Inc. at 4 (filed July 27, 2009); Comments of DragonWave Inc. in WT Docket No. 09-106 at 1 (filed July 22, 2009).

The worst abuse, consistent with the proposed rule, would be a system that transmits at a reduced data rate for the largest possible fraction of time that still yields the required average. A typical 30 MHz bandwidth system at 6 GHz, under normal conditions, might use 128-QAM modulation at 155 Mbps, comfortably in excess of the 134.1 Mbps minimum in Section 101.141. Suppose, when necessary to combat a deep fade, the system drops the modulation to QPSK at 39.47 Mbps.¹⁸ Suppose further that a careless or unscrupulous provider installs this radio in a link that, according to good engineering practice, needs more power or a better antenna, so the link encounters frequent fades. In such a misapplication, the radio could drop to the QPSK rate of 39.37 Mbps for up to 18 percent of the time, yet still comply with the “on average” requirement.

At the outset, this hypothetical is implausible in practice. The markets for Fixed Service equipment and services are highly competitive. A vendor or provider whose equipment delivered inferior service would not survive for long.

Moreover, bad as it may sound, operation at lower bit rates for 18 percent of the time is actually an improvement over the present rules. There is no minimum availability requirement. A system today could shut down completely for that same 18 percent for the time (or more) and still comply. The proposed “on average” rule thus makes things better—or at least no worse.

Finally, even our worst-case hypothetical system still meets the Commission’s spectrum efficiency goals. It does this by operating well in excess of the requirements most of the time. The rules reflect the Commission’s determination that adequate spectrum efficiency means (for example) that a 30 MHz transmitter in the 6 GHz band must deliver 134.1 Mbps. A system

¹⁸ This example is based on a particular product manufactured by an FWCC member. The manufacturer says QPSK operation yields an improvement in receiver threshold of 17 dB, relative to 128-QAM.

operating at 134.1 Mbps for 100 percent of the time obviously complies. It should not matter to the Commission if a system instead pushes through the same number of bits over time, but at varying data rates. The purpose of the rule is met equally well either way. The difference, of course, is that the system with varying data rates is better able to keep communications flowing when atmospheric conditions turn adverse.

The Commission’s proposed alternative is to allow lower bit rates during periods of “anomalous signal fading.”¹⁹ The FWCC agrees with the spirit of this approach, which closely tracks our own intent. We disfavor it only because it fails to provide the necessary operational guidance.

One definition of “anomalous signal fading” that reflects our own thinking, and possibly the Commission’s as well, would be along these lines:

a short-term inability to maintain data speeds listed in Section 101.141, as from temporary anomalous atmospheric conditions, in a system which is designed to maintain Section 101.141 speeds and in fact routinely does so in ordinary operation.

This wording tries to capture the short-lived and out-of-the-ordinary character of permissible low data rates. It also stresses the expected compliance of the link with Section 101.141 data rates in the ordinary course. But this language—and any other we can think of—fails to specify the requirements for staying in the Commission’s good graces. The dangers of latitude to deploy inefficient systems inconsistent with good engineering practices, which the Commission associates with the “on average” standard,²⁰ we think are much greater with the “anomalous signal fading” standard.

¹⁹ *Notice* at ¶ 39.

²⁰ *Notice* at ¶ 38.

The Commission could, in principle, specify the permissible number of seconds per incident, number of permissible incidents in a given time period, etc. But we hope it prefers not to micromanage at this level. Moreover, any such requirement presumably would also call for transmitters to monitor these properties, which would complicate equipment design (discussed below).

In short, for reasons of clarity and certainty, the FWCC thinks the “on average” standard is worth a second look.

3. *Other details*

We see no need to specify an absolute minimum payload capacity.²¹ Licensees have every incentive to keep the bit rate as high as possible, for as high a fraction of the time as possible. If operators are required to maintain an average bit rate, as we propose, then the Commission can be indifferent to the rate at any particular instant.

We agree with the Commission that equipment restrictions limiting use of adaptive modulation would not be in the public interest, because they would increase equipment prices for carriers and consumers.²² We also note that such restrictions are not necessary to assure compliance. The Fixed Service industry has a truly remarkable compliance record. A search of the public record back to the origin of the present rules, in 1996, turns up no enforcement activity at all—no forfeiture orders, and no notices of apparent liability—for Part 101 technical violations. The Commission can safely let manufacturers and operators choose their own mechanisms to ensure compliance.

²¹ *Notice* at ¶ 39.

²² *Notice* at ¶ 38.

We agree with AT&T that licensees intending to use adaptive modulation should so state in their prior coordination notices.²³ The slower modulations sometimes needed to overcome a fade may concentrate power into a narrower bandwidth, and so affect the interference potential. Placing adaptive modulation data in the coordination notice will also help the industry to self-police and prevent abuse of the rules.

The FWCC opposes the suggestion that licensees be required to log adaptive modulation events in station records under Section 101.217.²⁴ Currently the rules require logging only of measurements and maintenance, when personnel are on site. A requirement for automatic logging of adaptive modulation would require a complex and expensive equipment redesign for this purpose alone. Again, in view of the industry's compliance record, we think this is unnecessary.

In summary, adaptive modulation promises to improve system throughput and reliability, and has no realistically likely downside.

D. "AUXILIARY STATIONS"

The FWCC is on record as opposing this proposal.²⁵ FWCC comments on this issue are being filed in a separate pleading.

²³ Notice at ¶ 39.

²⁴ Notice at ¶ 39.

²⁵ Letter from Joseph M. Sandri, Jr. for the Fixed Wireless Communications Coalition to Marlene H. Dortch, Secretary, FCC, in WT Docket No. 07-121 (filed Feb. 27, 2009) (includes technical study); Letter from Angela C. Parsons for the Fixed Wireless Communications Coalition to Marlene H. Dortch, Secretary, FCC, in WT Docket No. 07-121 (filed Oct. 23, 2008); Reply Comments of the Fixed Wireless Communications Coalition in WT Docket No. 07-121 (filed Aug. 20, 2007); Letter from Dennis J. Guill for the Fixed Wireless Communications Coalition to Marlene H. Dortch, Secretary, FCC, in WT Docket No. 07-121 (filed March 26, 2007).

III. NOTICE OF INQUIRY ISSUES

A. EFFICIENCY STANDARDS IN RURAL AREAS

The Notice seeks comment on whether lowering efficiency standards (minimum payload capacities and/or minimum traffic loading payload percentages) in rural areas would lower backhaul costs without impairing spectrum efficiency.²⁶

The FWCC recommends caution. Ongoing national population shifts could result in rural areas becoming non-rural within the expected lifetime of a Fixed Service installation, thus locking in inefficient usage in areas where spectrum later becomes scarce.

We propose a compromise: maintain the current minimum payload capacities for all systems, but refrain from applying the minimum traffic loading payload percentages to rural links. This will ensure that equipment in place is capable of meeting minimum bit rate requirements, while eliminating unrealistic loading requirements in the meantime.

We suggest a link be considered “rural” if both ends of the link are in rural areas as defined in *Opportunities for Rural Telephone Companies to Provide Spectrum Based Services*.²⁷

B. SMALL ANTENNAS

The Notice seeks comment on whether to relax the Part 101 antenna standards to allow smaller antennas, on the grounds that they weigh less, need less structural support, cost less to maintain, can be installed at more sites, and raise fewer aesthetic objections.²⁸ On the other hand, smaller antennas produce a broader front radiation pattern, and more side and back

²⁶ Notice at ¶¶ 61-62

²⁷ 19 FCC Rcd 19078 at ¶ 11 (2004) (county or equivalent having population density of 100 persons per square mile or less).

²⁸ Notice at ¶ 66.

radiation, all of which raises interference potential and allows successful coordination of fewer links overall in a crowded environment.²⁹

A possible compromise would leave Category A standards unchanged while relaxing Category B standards. The latter are less demanding than Category A,³⁰ and after some further easing, might allow significantly smaller antennas. The rules should permit the use of these smaller antennas where congestion is not a problem, and require upgrades to better antennas where necessary.³¹

C. OTHER MODIFICATIONS

1. Sharing federal spectrum at 7125-8500 MHz

The FWCC has asked the Commission to explore the feasibility of allowing non-Federal users to share the very large Federal fixed spectrum band at 7125-8500 MHz.³² The proposal is pending and unopposed. The Commission could greatly expand the available Fixed Service spectrum for backhaul and other uses by pursuing this possibility.

2. Partial band coordination of earth stations in shared spectrum

Parts 25 and 101 of the Commission's Rules provide that certain bands are shared "coequally" by terrestrial Fixed Service and Fixed Satellite Service (FSS) users. In actual practice, however, the sharing is far from equal. The Commission routinely licenses an FSS earth station for all of an allocated band, with no showing of bandwidth needed, and with no

²⁹ Notice at ¶ 66.

³⁰ See 47 C.F.R. § 101.115(b)(table).

³¹ Experience suggests the rules should include a time limit specifying how fast Category B users must install Category A antennas, when conditions require the upgrade.

³² Petition for Rulemaking of the Fixed Wireless Communications Coalition in RM-11605 (filed March 16, 2010).

requirements as to efficiency or loading. Fixed Service operators sharing the same bands are limited to frequencies they actually need, and additionally are subject to stringent requirements for spectrum efficiency and loading. Additionally, earth stations are coordinated for the entire geosynchronous arc, while Fixed Service links can be coordinated only for the particular azimuths they actually use.

In 1999, the FWCC asked the Commission to limit the amount of spectrum an FSS earth station could coordinate and license, based on need, in those bands shared with point-to-point terrestrial Fixed Service. (We did not propose an azimuth limitation.) As an enforcement mechanism, we included a request for loading standards (but not efficiency standards) for wide-bandwidth earth stations.³³

The Commission issued a Notice of Proposed Rulemaking that laid out a different mechanism than that suggested by the FWCC.³⁴ The FWCC and the satellite industry both opposed the new proposal, whereupon the Commission terminated consideration of the issues.³⁵

The FWCC continues to believe that current coordination procedures tie up large amounts of shared spectrum that earth stations do not need and Fixed Service operators cannot use. The FWCC asks the Commission to reopen this issue and invite proposals from all affected parties on how best to open some of this spectrum to productive use, while still protecting the ability of earth stations to expand their operations as needed.

³³ Request for Declaratory Ruling and Petition for Rule Making of the Fixed Wireless Communications Coalition in RM-9649 (filed May 5, 1999). The FWCC also asked for a parallel change in the frequency coordination procedures.

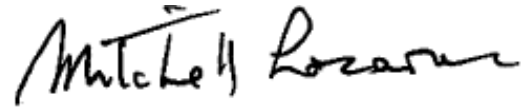
³⁴ *Partial-Band Licensing of Earth Stations in the Fixed-Satellite Service*, Notice of Proposed Rulemaking, 15 FCC Rcd 23127 (2000).

³⁵ *Partial-Band Licensing of Earth Stations in the Fixed-Satellite Service*, Second Report and Order, 17 FCC Rcd 2002 (2002).

CONCLUSION

The Commission should be aware of frequency coordination problems and spectrum inefficiencies in merging allocations among BAS, CARS, and the Fixed Service; should authorize adaptive modulation using an “on average” standard; should allow more flexibility as to efficiency standards and small antennas; and should explore federal sharing in the 7125-8500 MHz and more efficient sharing of spectrum with FSS earth stations.

Respectfully submitted,

A handwritten signature in black ink that reads "Mitchell Lazarus". The signature is written in a cursive, slightly slanted style.

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October 25, 2010

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