

**Before the
Federal Communications Commission
Washington, DC 20554**

In the Matter of)	
)	
Amendment of Part 101 of the Commission's)	WT Docket No. 10-153
Rules to Facilitate the Use of 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)	WT Docket No. 09-106
101.141(a)(3) of the Commission's Rules)	
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 VERIZON AND VERIZON WIRELESS ON THE NOTICE OF
PROPOSED RULEMAKING AND THE NOTICE OF INQUIRY**

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Verizon and Verizon Wireless (collectively, “Verizon”)¹ respectfully submit these comments on the Commission’s NPRM and NOI issued in the above-captioned proceeding. In this proceeding, the Commission seeks to “increase efficient use of spectrum for backhaul,”² including by “enabling more flexible and cost-effective microwave services.”³ Verizon agrees it is important to ensure that adequate spectrum is available for broadband operations generally, including for backhaul services, and that available spectrum is properly managed.

Verizon supports the Commission’s efforts in this proceeding to make additional spectrum available for Fixed Service (FS) operations, which will help supplement existing and emerging backhaul alternatives. But the Commission should make sure it does not sacrifice policies designed to increase efficiency and to minimize interference and potential for misuse of available spectrum in the course of those efforts. An overarching principle should be to ensure that spectrum efficiency policies are not compromised, whether the Commission is seeking to make more spectrum available for wireless operations or to remove regulatory constraints on the use of existing spectrum.

That principle is important when evaluating the proposed rules. For example, while the proposed “adaptive modulation” rule (*see NPRM/NOI*, Section IV.C) would promote the Commission’s objective of enabling more flexible and cost-effective microwave services, the rule must be accompanied by clear, enforceable protections to ensure it does not create incentives to design spectrally inefficient systems.

¹ In addition to Verizon Wireless, the Verizon companies participating in this filing are the regulated, wholly owned subsidiaries of Verizon Communications Inc.

² *Amendment of Part 101 of the Commission’s Rules to Facilitate the Use of Microwave for Wireless Backhaul and Other Uses and to Provide Additional Flexibility to Broadcast Auxiliary Service and Operational Fixed Microwave Licensees, et al.*, Notice of Proposed Rulemaking and Notice of Inquiry, 25 FCC Rcd 11246, ¶ 1(2010) (“*NPRM/NOI*”).

³ *Id.* ¶ 3.

Also, the Commission should reject the “auxiliary stations” concept (*see NPRM/NOI* Section VI.D) because it would seriously undermine the Commission’s objective of promoting “cost-efficient access to adequate backhaul.”⁴ The proposed rule would result in less usable spectrum for backhaul and other critical services, and in increased costs for those operating existing systems or building new primary links.

DISCUSSION

I. THE COMMISSION SHOULD CONSIDER MAKING APPROPRIATE ADDITIONAL SPECTRUM AVAILABLE.

Given the growth in the nation’s communications industry, it is appropriate for the Commission to explore ways to make additional spectrum available for advanced services. Part IV.A of the *NPRM/NOI* seeks comment on making additional spectrum available for Part 101 FS operations. The *NPRM/NOI* states that authorizing FS operations in “certain bands that have been reserved for specialized microwave service” is one option for “meeting the increasing demand for FS for backhaul and other vital services.”⁵ The proposal, if properly implemented, has merit. Making available additional spectrum for microwave FS operations could help supplement other backhaul alternatives, thereby promoting the future deployment of advanced communications services.

Fixed microwave services are a segment of a robust industry in which various types of providers – including cable companies, CLECs, fiber providers, as well as fixed wireless operators – compete to deliver important high-capacity services.⁶ Of course, demand for advanced services is growing as the nation’s communications infrastructure evolves. For

⁴ *Id.* ¶ 38.

⁵ *Id.* ¶ 11.

⁶ Although the *NPRM/NOI* focuses on backhaul for the wireless industry, fixed microwave operations are also of course crucial in providing public safety, utility, and other critical services.

example, as Verizon Wireless and other wireless providers have upgraded to 3G and are upgrading to 4G networks, wireless traffic volumes have increased and will continue to increase exponentially, making it necessary for providers to upgrade to higher-capacity facilities.⁷ Given that growth, Verizon supports efforts to make additional spectrum available for broadband related uses, including for FS microwave operations.

Of course, for additional microwave spectrum to be useful for the sorts of high-capacity services demanded by the wireless industry, the spectrum must be appropriate for FS applications. As the *NPRM/NOI* notes, the 7 GHz and 13 GHz bands are generally “well suited” for wireless backhaul and other microwave applications.⁸ Verizon therefore would support appropriate rule changes that would make these bands widely available for wireless backhaul.

These BAS and CARS bands, however, currently contain a variety of fixed, temporary fixed, and mobile services that, at least initially, could make spectrum sharing with Part 101 FS operations difficult. Therefore, to make the 7 GHz and 13 GHz bands suitable for wireless backhaul, the Commission should consider band segmentation that would align similar BAS, CARS and Part 101 FS systems in specified channels. Whatever channelization scheme is ultimately adopted should include channel bandwidths of at least 30 megahertz for Part 101 FS operations as narrower channels do not provide adequate capacity for wireless backhaul supporting next-generation mobile wireless technologies. With band segmentation, the role of the 7 GHz and 13 GHz bands could be expanded greatly, leading to greater spectrum efficiency and increased opportunities for wireless backhaul deployments. Thus, Verizon encourages the

⁷ Independent analysts at Bernstein Research recently estimated that the overall market for wireless backhaul will total more than \$7 billion by the end of 2011 – more than twice its 2007 level. See Craig Moffett, *et al.*, Bernstein Research, “U.S. Cable & U.S. Telcom: Getting Down to Business -the Battle for Commercial Services and Wireless Backhaul,” at 16-17 (Sep. 8, 2010).

⁸ *NPRM/NOI* ¶¶ 14, 16.

Commission to continue to investigate making the 7 GHz and 13 GHz available for Part 101 FS systems by carefully studying interference-related compatibility issues between BAS/CARS operations and FS systems and possible solutions to those issues.

In any event, Verizon agrees with the Commission's tentative conclusion⁹ that the 2 GHz band is not appropriate spectrum for the data-intensive links required for wireless backhaul.

II. THE COMMISSION SHOULD MODIFY THE PROPOSED “ADAPTIVE MODULATION” RULE TO INCLUDE CLEAR, ENFORCEABLE PROTECTIONS AGAINST MISUSE.

As described in the *NPRM/NOI*, Section 101.141(a)(3) of the Commission's Rules sets forth minimum payload capacities for various channel sizes in certain Part 101 bands.¹⁰ The purpose of that rule is to promote “efficient frequency use.”¹¹ Without such minimum performance requirements, fixed wireless applicants could occupy large bandwidth channels to deliver low capacity payloads. Such inefficient use would limit the amount of spectrum available for future users of the band. Accordingly, preservation of appropriate minimum payload requirements must be a cornerstone of the Commission's policy as it seeks to promote its goal of “more flexible and cost-effective microwave services.”¹²

The proposed rule change would modify Section 101.141(a)(3) to authorize licensees to avoid the rule's capacity and loading requirements during “anomalous signal fading” if such non-compliant modulations are “necessary” to adjust to a modulation that allows them to “maintain communications.”¹³ Such changes would have reliability benefits. However, to ensure licensees do not implement adaptive modulation in ways that may crowd out future users,

⁹ *NPRM/NOI* ¶ 14.

¹⁰ *NPRM/NOI* ¶ 29.

¹¹ *Id.*

¹² *Id.* ¶ 3.

¹³ *Id.* ¶ 39.

the rules should include appropriate enforceable protections to prevent their misuse and to limit the scope and duration of deviations from Section 101.141(a)(3)'s minimum payload capacity requirements. An adaptive modulation rule that includes such protections would be in the public interest because it would result in enhanced link reliability while upholding important spectrum efficiency policies.

A. Without Appropriate Protections, the Proposed Rule Has a High Potential for Abuse.

Authorizing adaptive modulations as permitted by the proposed rule has the potential to increase the reliability of critical microwave links. However, with increasing demand for spectrum in the lower frequency bands, and the current availability of microwave equipment supporting higher efficiency modulations (e.g., 256 QAM), the Commission should avoid any rule change that results in a significant relaxation of current spectral efficiency requirements. Less spectrally efficient modulations do generally provide higher system gain that may allow operators to relax design requirements, but that advantage comes with a potential serious disadvantage: the use of excess spectrum. Without appropriate restrictions, future users either may not be able to find suitable spectrum or be forced to implement high-cost solutions to work around lower-cost spectrally inefficient incumbent band users.

For example, without appropriate limits and conditions on periods of non-compliant operation, licensees whose loading currently would require the use of a narrowband channel (e.g., 10 MHz) could instead take a wideband (e.g., 30 MHz) channel that could provide a lower cost solution by employing less spectrally efficient modulations. Similarly, if not limited, the use of non-compliant modulations (i.e. modulations that do not comply with the minimum performance requirements of Section 101.141(a)(3)) will predictably increase the use of minimal standard antennas and result in additional constraints for future band users. Thus, instead of

improving availability of links carrying critical traffic, the non-compliant modulations may simply be used to allow deployment of smaller antennas with poor interference suppression characteristics. These minimal standard antennas would result in a significant further loss of spectral efficiency and band-sharing capacity.

Thus, any permitted deviation from the minimum payload capacity requirements must be, as the Commission noted, narrowly tailored to “allow licensees to take advantage of the benefits of adaptive modulation without unduly undercutting the efficiency purpose that led to initial adoption of the minimum efficiency requirement.”¹⁴ There is no need to fundamentally overhaul the existing minimum performance framework under Section 101.141(a)(3) to achieve the reliability benefits of adaptive modulation. Most cellular backhaul, public safety, and other licensees that use these frequency bands to deliver critical traffic design paths for 99.999% availability or higher at data rates exceeding the minimum payload capacities required in Section 101.141(a)(3). Few paths are planned for availability of less than 99.995%. At these availabilities, any propagation-based outages are necessarily expected to be rare and of short duration. In order to minimize propagation-related loss of connectivity to insignificance on reliable paths carrying critical traffic, a large increase in fade margin is not necessary.

However, the proposed framework, without modification, poses a substantial risk of “unduly undercutting” the minimum efficiency requirements of Section 101.141(a)(3). A path designed to be dependent on non-compliant modulations (such as one with inadequate clearance) could experience high levels of signal fading on a regular basis. It may not be apparent whether use of non-compliant modulations on this type of path is due to truly “anomalous” propagation

¹⁴ *Id.* ¶ 39.

or simply expected propagation due to a compromised design. It is likely some users would be motivated to pursue such link designs if the proposed rule is implemented as currently drafted.¹⁵

B. The Commission Should Establish Clear, Enforceable Protections to Prevent Abuses.

If the spectrum in the lower frequency fixed service bands far exceeded projected requirements, simply relaxing existing spectral efficiency requirements in Section 101.141(a)(3) might be appropriate. However, with substantial and increasing demand for high-capacity data links in these heavily-used critical bands, alteration in the minimum payload capacity requirements must be accompanied by protections to prevent misuse.

1. A Simple Minimum Efficiency Standard of Two-Thirds of the Complaint Values Specified in Section 101.141(a)(3) Would Provide Substantial Spectral Protection While Significantly Increasing Link Reliability.

A minimum efficiency standard below which a licensee may not fall even when using adaptive modulation, such as contemplated in the *NPRM/NOI*,¹⁶ is the most important protection needed to limit the potential loss of spectral efficiency while at the same time ensuring that adaptive modulation can aid in maintaining connectivity on well-designed paths. Specifically, the Commission should establish a simple bright-line rule: the minimum payload capacity of non-compliant modulations employed in authorized adaptive modulation radio equipment should be set at two-thirds of the minimum payload capacities already set forth in Section 101.141(a)(3).

¹⁵ A similar problem with the proposed framework is that what is “necessary to maintain communication” is undefined. In order to “maintain communications” on a link during periods of anomalous propagation, most adaptive systems must anticipate the potential loss of communications and initiate a change of state while communications between sites is still possible. Without further definition or appropriate protections, “maintain communications” could be interpreted as allowing a non-compliant modulation even if only minimal fade (e.g., 10 dB) or a bit error condition unrelated to propagation occurs.

¹⁶ *NPRM/NOI* ¶ 39.

This well-defined limit has the advantages of being specific, enforceable, and based on the band and channel bandwidth dependencies already established in Section 101.141(a)(3).

There is no demonstrated need to increase reliability benefits beyond what would be achieved by a two-thirds rule. Most digital radio equipment now being deployed in support of broadband data services currently operates at fixed data rates that exceed the minimum efficiency requirements. For example, in 30 MHz bandwidth channels at 6 GHz, 155 Mbps (128 QAM) equipment is in common use and 180 Mbps equipment (256 QAM) is now available. Two-thirds of the existing 134.1 Mbps (30 MHz bandwidth, 6 GHz) minimum payload capacity would allow temporary operation at 89.4 Mbps (typically 16 QAM) and a receiver threshold improvement of 9 dB (vs. 128 QAM) to 12 dB (vs. 256 QAM). That 9 dB to 12 dB short-term improvement in threshold is significant for high-availability paths that are required to support critical services.¹⁷ For any fading mechanism, a 10 dB fade margin increase on a high-availability (e.g., 99.999%) path would be expected to minimize propagation induced communication outages to insignificant levels.

Thus, limiting the use of non-compliant adaptive modulation payloads to two-thirds of the minimum payload capacity values specified in Section 101.141(a)(3) will permit a worthwhile improvement in the ability to maintain communications during rare fading events on well-designed paths. At the same time, this two-thirds limit, along with other conditions proposed, will prevent the “undercutting”¹⁸ of the current spectrum efficiency requirements that could result from a more aggressive approach. Thus, although other conditions on the use of non-compliant modulation states are also appropriate, in no case should authorized radio

¹⁷ For multipath fading at 6 GHz, standard methodology predicts an order-of-magnitude (factor of 10) reduction in outage for a 10 dB improvement in fade margin on the typical non-space diversity path. If space diversity is used, the improvement will be greater.

¹⁸ *NPRM/NOI* ¶ 39.

equipment be allowed to operate below two-thirds of the Section 101.141(a)(3) spectral efficiency requirements during periods of non-compliant operation.

2. Time-Based Conditions Should Be Employed to Limit the Use of Non-Compliant Modulations.

As acknowledged in the *NPRM/NOI*, consideration must be given to what conditions must be present in order to allow payload capacities to fall below the current minimum payload capacities specified in Section 101.141(a)(3). Specifically, the *NPRM/NOI* seeks comment on the definition of “anomalous signal fading” and on whether the rules should specify a “minimum amount of time a link is operational.”¹⁹ In this context, “anomalous signal fading” can be described as: “Rare atmospheric induced signal conditions that cause a properly designed high-reliability link to experience traffic outage, uncorrected bit errors, or pre-error conditions (including a near-threshold signal level) that indicate that loss of connectivity may be imminent.” For this definition, a “high-reliability path” is assumed to be high-reliability (e.g., 99.999% availability) while using a compliant modulation.

With the above definition, the time that anomalous propagation conditions are expected will closely correspond to the time that a path is “unavailable” (e.g. 0.001%) when a compliant modulation is in use. Thus, a time-based restriction based on the expected path availability when operating at a modulation that meets Section 101.141(a)(3) can be used to set a limit of the “time a link is operational”²⁰ while using non-compliant modulations.

The best method for implementing time-based restrictions on non-compliant operation is the establishment of path design-based estimates. Standard methodologies are available for estimating long-term fading statistics caused by path obstruction, multipath and rain. Although

¹⁹ *NPRM/NOI* ¶ 39.

²⁰ *Id.*

not all fading mechanisms can be modeled accurately, relatively simple analysis should be able to indicate whether a path is designed to support high-reliability operation at a modulation state that meets Section 101.141(a)(3) minimum payload capacity values. The proposed rule should refer this issue to an appropriate standards-setting body for development of path design-based estimates.²¹

To prevent misuse of adaptive modulation, fading calculations should predict path availabilities of 99.999% or higher when a compliant modulation is in use. This target value would be an indication that a highly reliable path has been planned and that the limited use of adaptive modulation to maintain connectivity will not be abused to the detriment of sound spectral efficiency policy. To aid in enforcement, fixed service operators who propose use of non-compliant modulations should be required to affirm on the license application that the time-based requirements governing non-compliant operation are met, and to include supporting calculations with the frequency coordination supplemental showing exhibit that confirms compliance with Section 101.103(d) requirements.

C. Other Technical Considerations.

1. The Rules Should Limit the Interference Potential of Non-Compliant Transmissions.

To limit interference potential, any non-compliant modulation transmitted signal should not be permitted to cause a significantly higher level of interference in a victim receiver than a compliant modulation supported by the same transmission equipment. Both the total transmit

²¹ Another (non-preferred) option for implementing a time-based limitation would be to require authorized transmission equipment to include a timer function that would limit the use of non-compliant modulations to a set value (e.g., several minutes) over a specific time period (e.g., 24 hours). However, although simple in concept, use of such a timer could cause outages during very infrequent, but long-duration fading events (e.g., destructive ducting or sustained high-rain rate events) that are difficult to accurately model or predict.

power and power spectral density of any non-compliant modulation should be limited to no more than 3 dB greater than the values of the worst-case (highest total signal power, highest power density) values of the available compliant modulations. In addition, the emission bandwidth of any non-compliant modulation should closely match, and not exceed, that of the compliant modulation states.

2. The Commission Should Consider Limitations on Operators' Ability to Override Operational Restrictions.

Presumably, adaptive modulation systems will be designed to switch to non-compliant modulations only when fading or error-related indicators predict possible loss of communications. As another protection against abuse, limitations on operator ability to alter switching algorithms or to “lock down” on a non-compliant modulation should be considered as an equipment authorization requirement. Any operational changes that are allowed should be included in the station records under Section 101.217, as contemplated in paragraph 39 of the *NPRM/NOI*. The Commission should develop a full record regarding appropriate limitations on operators' ability to override operational restrictions.

3. Rule 101.103 Should Provide Greater Detail About the Frequency Coordination Process.

The proposed rules include a revision to Section 101.103 that requires a prior coordination notice for a path to disclose the use of non-compliant modulations. Disclosure is appropriate, as all modulations must be considered in evaluation of potential interference conflicts. In addition to disclosing the potential use of non-compliant modulations, the applicant should be required to disclose its calculations supporting the path design time-based estimates (*see* Section II.B.2, *supra*) to be employed.

More broadly the Commission should provide greater clarity regarding how the frequency coordination process is to aid in enforcement, including details regarding how the process will be used to identify potential misuses of the adaptive modulation technique. For example, presently, unless an interference issue is identified, there may be no basis for a coordination recipient to object to a potentially improper use of adaptive modulation. Given that it is future users whose interests would be compromised by misuse of the proposed rules, at a minimum, the Commission should make clear that notice recipients will have standing to object regardless of whether they would be directly affected by the proposed operation.

D. The Commission Should Consider Equipment Restrictions as a Potential Tool for Ensuring Spectrally Efficient Adaptive Modulations.

Verizon has previously proposed requiring transmission equipment vendors to implement features to ensure that current spectrum efficiency requirements are not significantly compromised. Verizon also proposed equipment restrictions to prevent any non-compliant operation from resulting in excessive interference potential to other users.²² The *NPRM/NOI* tentatively concludes that such equipment restrictions “would not be in the public interest” because it “could increase equipment prices for carriers and consumers.”²³ But such equipment restrictions, especially the two-thirds lower limit discussed above, are in the public interest because they are likely to be low-cost and they represent a straightforward way to prevent abuse of the adaptive modulation technique.

²² See Comments of Verizon, *Request for Interpretation of Section 101.141(a)(3) of the Commission’s Rules to Permit the Use of Adaptive Modulation Systems*, WT Docket No. 09-106, at 3-4 (July 27, 2009).

²³ *NPRM/NOI* ¶ 38.

The minimum payload capacities required by Section 101.141(a)(3) are already enforced as an equipment authorization condition,²⁴ so Verizon’s proposal involves simply enforcing revised restrictions. The costs of implementing such equipment related changes (e.g., software updates) have not been quantified, and there is no basis to assume they would be prohibitively high. Given the substantial deployment and operational costs already associated with links in these critical fixed band services, it is unlikely the costs caused by revising existing equipment authorization conditions would be material – let alone high enough to outweigh the substantial public policy benefits the restrictions would achieve.

III. THE COMMISSION SHOULD NOT ADOPT THE “AUXILIARY STATION” PROPOSAL.

A. The Proposal Would Directly Undermine the Commission’s Goal of Promoting “Cost-Efficient Access to Adequate Backhaul.”²⁵

Rather than potentially offer “substantially greater spatial reuse of microwave spectrum” and a reduction in “the cost of using FS spectrum for backhaul and other important purposes,” as suggested in the *NPRM/NOI*,²⁶ the auxiliary stations proposal would have the opposite effect. It would lead to less usable spectrum for backhaul and other services, and increased costs for those operating existing systems or building new primary links. Therefore, the Commission should not adopt the proposal.

The Commission has correctly determined that the Request for Declaratory Ruling submitted by Wireless Strategies, Inc. (WSI) is inconsistent with multiple sections of Part 101 rules and should be denied.²⁷ However, the proposed revised rules in Section IV.D. of the

²⁴ Section 101.141(a)(3) establishes capacity and loading requirements that “must be met for equipment applied for, authorized, and placed in service after June 1, 1997.”

²⁵ *NPRM/NOI* ¶ 38.

²⁶ *Id.* ¶ 41.

²⁷ *Id.* ¶ 49.

NPRM/NOI support an “auxiliary station” concept that suffers from the same flaws as WSI’s initial proposal and is incompatible with site-based Part 101 fixed microwave services. Although the term “auxiliary station” replaces the “distributed radiating element” initially proposed by WSI, the proposal still fails to provide for reliability, payload capacity and surety of continuing service required for cellular backhaul services. The proposal would incentivize and authorize the engineering of paths that maximize interference potential. It would also substantially complicate and increase the costs of using crucial microwave frequencies.

1. The Proposal Threatens to Fundamentally Alter the Use of Fixed Microwave Spectrum Allocations to the Detriment of Future Users.

The Commission should reject the auxiliary stations proposal because it is patently inconsistent with the principles underlying the FS licensing methodology. Today, Fixed Services are used primarily for the transport on a point-to-point basis of critical telecommunications traffic by public safety, private and common carrier licensees. Moreover, the Fixed Services licensing regime – which enables parties to acquire spectrum outside of competitive bidding – is premised on the fact that licensees are not entitled to use anything but the particular location and radiating parameters for which they are specifically authorized.²⁸

The proposal is inconsistent with these principles because it effectively contemplates using fixed microwave spectrum to provide commercial services on a point-to-multipoint basis. This type of operating authority would create incentives for interested operators to expand their “service areas” by specifying excessive transmitter power and utilizing minimal standard

²⁸ See *Implementation of Section 309(j) of the Communications Act—Competitive Bidding*, Second Report and Order, 9 FCC Rcd 2348, ¶ 43 (1994) (stating that “point-to-point microwave frequencies regulated under Parts 21 and 94 of the Commission’s rules will not be subject to competitive bidding”).

antennas. The coupling of excessively high output power with poor antenna performance would increase the preclusive effect on stations seeking to expand their primary fixed service paths.

2. The Proposal Would Reduce Spectrum Available to Future Entrants by Causing Excessive Interference.

As proposed, the auxiliary sites, with only secondary status, would have no interference protection and would be subject to shut-down if interference conflicts develop with existing or newly proposed paths. However, as acknowledged in the *NPRM/NOI*, the “protection rights of the main link” will result in some degree of interference protection for associated auxiliary sites.²⁹ Thus, to help ensure continued operation of a point-to-multipoint deployment using “auxiliary stations,” the main link is likely to be designed to cause as much interference as possible to, and to be susceptible to receiving as much interference from, other users attempting to deploy co-channel links in the coordination area.

Predictably, in a planned point-to-multipoint deployment, the design of the main link will not be based primarily on providing communications between the end sites, but instead based on using interference-related defensive strategies to attempt to “establish pseudo-geographic service areas”³⁰ by radiating as much off-path radiation as possible. In fact the “main link” may be only an “incidental link” consisting of two multipoint hub sites and necessary equipment to justify a Part 101 primary license.³¹

²⁹ *NPRM/NOI* ¶ 52 (third bullet point).

³⁰ *Id.* ¶ 57.

³¹ The Commission also seeks comment on the applicability of Section 101.113(a), which requires that transmit power be limited to “the minimum amount of power necessary to carry out the communications desired.” *NPRM/NOI* ¶ 57. The auxiliary station proposal is inconsistent with Section 101.113(a) because it is based on the incorrect premise that off-path interference can be exploited to support a multipoint deployment. Similarly, the proposal is inconsistent with Section 101.103(d)(1), which requires the licensee cooperate “in order to minimize interference.”

Past experience confirms the sorts of abuses to be expected if auxiliary stations are authorized. Paths engineered by WSI indicate a strategy to provide off-path service to “auxiliary stations” while limiting spectrum access to others attempting to share the spectrum. Two WSI paths in the Baltimore area that were licensed in January 2007 (WQGH695, 696, 697) illustrate the type of deployment strategy and resulting abuse that can be anticipated if the auxiliary site concept is approved. WSI issued the prior coordination notice in October 2006, filed completion of construction on the sites in July 2008, and terminated the licenses on July 27, 2010. Based on the coordination and license data, each of these two paths were placed in service with the following equipment at each of the three sites:

- Minimum standard transmit/receive antenna:
 - Model Wireless Strategies Inc., AAS-106P 2.2 degrees beamwidth
 - Radiation suppression pattern is minimum Standard A
 - At three sites, centerlines of 130 ft, 280 ft, and 531 ft AGL
- Diversity receive antenna with 16.5 dBi gain, 163.0 degrees beamwidth
- Transmission equipment MDR-8606-135 with “PA” (power amplifier)
- EIRP 84.7 dBm (295 kW)
- Transmit frequencies 6123.10 MHz and 6375.14 MHz

These two paths were clearly designed and constructed to provide off-path service to “distributed radiating elements” or “auxiliary stations,” while limiting spectrum access to others attempting to share the spectrum. Near-maximum potential interference is caused by each of the three sites by licensing a hypothetical antenna that only meets minimum Standard A requirements and by including a 16 dB gain (60 W) power amplifier on a radio not authorized with that option. The resulting EIRP is just under the maximum of 55 dBW (85.0 dBm) specified in Section 101.113.

Moreover, either to allow for eventual time-division-duplex (TDD) operation that is not possible with MDR-8606-135, or to intentionally cause interference difficulties for others, the same transmit frequencies were licensed at each site. TDD operation in Fixed Service bands

where frequency-division-duplex (FDD) microwave systems have been the standard for decades will result in a serious loss of spectrum efficiency and limit spectrum available for future use.

Although the *NPRM/NOI* mentions “substantially greater spatial reuse of microwave spectrum” as a potential benefit of the auxiliary station concept,³² in fact the WSI deployment strategy illustrates the high-level of spectral *inefficiency* likely to be deliberately caused by future main links that create pseudo-geographic “service areas” and that radiate enough off-path energy to communicate with undefined potential remote sites. Indeed, during the three and one-half years between the frequency coordination and termination of the three WSI licenses, a “greater spatial reuse” of spectrum certainly was not achieved. By maximizing on-path and off-path radiated power from high antenna centerlines, while claiming to transmit and receive on the same frequencies at each site, WSI eliminated the use of 6 GHz spectrum by potential band users for geographic areas far exceeding that of any hypothetical “spatial reuse” benefit of auxiliary site operation. This real-world example illustrates the abuses likely to be caused by the proposed auxiliary station rule.

3. The Proposal Would Dramatically Complicate and Raise the Costs of Planning and Operating Fixed Wireless Systems.

Interference from secondary auxiliary sites also is a threat to other band users. As noted in paragraph 49 of the *NPRM/NOI*, interference is evaluated in the frequency coordination process on a direct interfering path site-to-site basis, considering polarization dependent antenna patterns, intervening terrain, building blockage, and other local shielding. The site-to-site analysis is required because there is no defined geographic boundary or field strength contour that inherently limits other point-to-point microwave paths from sharing spectrum.

³² *Id.* ¶ 41.

Each auxiliary site will also require evaluation as an interference source. However, unlike primary point-to-point interference sources, the small “one-foot-or less”³³ antennas at these sites will more frequently be at low elevations where nearby scattering and reflecting objects will unpredictably distort an already poor radiation suppression pattern and make direct path site-to-site prediction methods unreliable.

Using measurements to evaluate interference into an operating system is *already* intrusive, inconvenient, and expensive. With tens or hundreds of intermittently transmitting co-channel auxiliary stations as potential sources, the situation will be considerably worse and possibly unmanageable. If auxiliary operation is allowed, other band users will incur substantial additional costs in order to protect their critical traffic from the incremental additions of the “low-cost” auxiliary stations to a main link. That result is contrary to sound public policy.

B. The Commission Should Be Aware that the Present Rulemaking May Result in Speculative Frequency Coordination Activity in Anticipation of Possible Auxiliary Station Rules.

Assigning a proposed rulemaking status to the auxiliary station concept may result in speculative frequency coordinations of “incidental” main link paths that will attempt to block other users from accessing frequencies needed to implement or expand microwave systems. As an example, the Commission should consider the frequency coordinations issued recently on behalf of OEM Communication LLC that proposed a 11 GHz two link system in the San Jose, CA area.³⁴ Each of three sites was specified with the same two transmit channels, with 24 dB gain “PAs” that increase the claimed transmitted output powers to 45.1 dBm, with near-maximum EIRPs of 84.7 dBm (295 kW), and with a self-manufactured “OC-1100A” model

³³ *Id.* ¶ 46.

³⁴ *See* Wireless Applications Corp. PCN Job No. CAOEMC2010-01-02 for OEM Communications LLC (July 1, 2010); *see also* Wireless Applications Corp. PCN Job No. CAOEMC2010-03-04 for OEM Communications LLC (July 2, 2010).

antenna (“Smart Adaptive Antenna System”) that just meets Standard A minimum radiation suppression requirements. Future users seeking 11 GHz channels in the San Jose area and beyond will obviously be limited by the poor antennas and the near-maximum EIRP specified in the frequency coordination.³⁵

As long as the auxiliary site proposal remains alive, such speculative activity is likely to continue. To prevent such speculation, the Commission should consider measures to ensure that, prior to a final ruling on the auxiliary station concept, the frequency coordination process cannot be an offensive weapon used to attempt to establish “first entry” rights for any potential future auxiliary site deployment.

C. All Microwave Bands Potentially Affected By the Proposed Rule Support Crucial Backhaul and Other Critical Services and Should Not Be Candidates for the Proposed Multi-Point Auxiliary Stations.

Paragraph 56 of the *NPRM/NOI* notes that the 6 GHz bands are currently highly congested and that there are areas where it is already “impossible to coordinate” 30 megahertz bandwidth links in that band. The Commission requests comments on “whether there is sufficient capacity in those [6 GHz] bands to accommodate many operations of the type contemplated by WSI.”³⁶ While possibly true that the harmful effects of the proposal may be particular strong in the 6 GHz bands,³⁷ none of the microwave point-to-point spectrum should be degraded by an auxiliary stations rule. Both the 6 GHz bands as well as other Fixed Service

³⁵ In an attachment accompanying the coordination notice, OEM Communications also claimed without explanation that the predicted interference cases into existing band users resulting from the three proposed sites would be resolved by an “ERP Adjustment in Direction of Victim” that varied between 14 dB and 52 dB.

³⁶ *Id.*

³⁷ Due to the propagation characteristics at 6 GHz, links will be susceptible to sporadic long-distance interference from the “maximum interference” strategy likely to be followed under the proposal. With high antenna centerlines, minimal standard antennas, and near maximum EIRP, operating and planned co-channel 6 GHz systems at 150 miles or more will be threatened with harmful and even catastrophic interference.

bands at 11 GHz and below support the crucial longer backhaul links needed for expansion of broadband services, and all point-to-point microwave spectrum should be protected from major risks that the auxiliary stations proposal would create.³⁸ Enacting the proposed rule would undercut the Commission's goal of facilitating the expansion of microwave backhaul capacity and should be rejected with respect to all point-to-point microwave spectrums.

CONCLUSION

For the reasons set forth above, the Commission should proceed with efforts to make additional microwave spectrum available for FS operations, but in doing so it should ensure that the spectrum is appropriate for FS applications and usable for the sorts of microwave FS services that are demanded. It should implement the proposed adaptive modulation rule provided that it also establishes sufficient protections to ensure spectral efficiency. And it should reject the "auxiliary stations" rule as contrary to sound public policy.

³⁸ Ample area-licensed spectrum has been allocated in the 24 GHz Digital Electronic Message Service, 27-29 GHz / 31 GHz Local Multipoint Distribution Service, and 38.6-40.0 GHz bands. With auxiliary stations having an uncertain secondary status, the 3.6 GHz band or the unlicensed 2.4 GHz and 5 GHz bands could provide a better alternative than the FS bands now considered.

Respectfully submitted,



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