

Before the
Federal Communications Commission
Washington DC 20554

In the Matter of)
)
Wireless Telecommunications Bureau Seeks) WT Docket No. 09-106
Comment on Request of Alcatel-Lucent, *et al.*)
for Interpretation of 47 C.F.R. § 101.141(a)(3))
to Permit the Use of Adaptive Modulation Systems)

**REPLY COMMENTS OF THE
FIXED WIRELESS COMMUNICATIONS COALITION**

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The Fixed Wireless Communications Coalition (“FWCC”)¹ files these reply comments in support of the above-captioned request to permit the use of adaptive modulation in fixed microwave systems.² The FWCC is one of the signatories to the original request.

A. SUMMARY

On May 8, 2009, seven parties prominent in the microwave Fixed Service jointly requested an interpretation of Section 101.141(a)(3).³ That rule sets minimum payload capacities for various

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 and private cable 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 See *Wireless Telecommunications Bureau Seeks Comment on Request of Alcatel-Lucent, et al. for Interpretation of 47 C.F.R. § 101.141(a)(3) To Permit the Use of Adaptive Modulation Systems*, WT Docket No. 09-106, DA 09-1427 (released June 25, 2009).

³ The filing parties are Alcatel-Lucent, Dragonwave Inc., Ericsson Inc., Exalt Communications, Fixed Wireless Communications Coalition, Harris Stratex Networks, and Motorola, Inc.

fixed service microwave bands. For example, a transmitter occupying a 30 MHz channel in the 6 GHz band must be capable of 134.1 Megabits/second.⁴ In the past, industry participants have read the rule exclusive of other sections of Part 101, as imposing these minimum payload capacities whenever the transmitter is operating over the air, and regardless of the far-end receiver's ability to successfully receive the signal. As we discuss below, however, other provisions in the rules assume the use of good engineering practices throughout, including design of the path for high availability and the receiver's ability to capture sufficient signal for reliable operation.

The May 8 request asked the Commission to interpret the numbers in Section 101.141(a)(3) as averages, not instantaneous values. This would enable a system to maintain communications by using lower data rates during brief periods when the link would otherwise be temporarily out of service, such as during atmospheric fades. It would also eliminate the need to re-synchronize the system, which can take several minutes, after communications are restored. The request argues, in effect, that a temporarily low data rate makes better use of the spectrum than no transmission at all.

The technique of choosing modulation on the fly is called “adaptive modulation.” There is no question as to its compliance if all of the available modulations exceed the minimum, which is the case for the adaptive modulation systems in use today. A grant of the request would clarify that adaptive modulation is within the rules even if the data rate may briefly dip below the minimum, when needed to maintain communications and synchronization. The request ensures continued spectrum efficiency by proposing that links be required to meet the value in the rules in ordinary operation (and also on average).

⁴ 47 C.F.R. § 101.141(a)(3).

All of the commenters agree that adaptive modulation will improve performance and enhance system reliability.

One commenting party, Verizon, is concerned that a grant of the request will encourage installation of substandard, spectrum-inefficient systems that meet the required minimum data rate on average, yet operate for a substantial percentage of the time at data rates well below those specified in the rules. Verizon urges the Commission, if it grants the request, to specify performance standards that preclude this kind of operation.

Verizon raises a potentially important issue, but one having no direct connection to adaptive modulation. It addresses the property of “availability,” or percentage of time a system operates at its full rated data speed. The present request has no effect on policies or rules relating to availability. A low-availability system failing to meet Commission standards now would still fail after adaptive modulation is approved. An application for such a system should be easily identified by the frequency coordinators.

The Commission may at some point wish to consider a Part 101 rulemaking on availability. But it need not say anything new on the subject in order to approve adaptive modulation. Recent Part 101 rulemakings have been slow, typically taking three to five years. There is no need to hold up the benefits of adaptive modulation while the Commission resolves an unrelated question.

We do support the Commission’s emphasizing, in a grant of the request, the need for systems using adaptive modulation to comply with the existing rules calculated to promote quality of service and efficient use of spectrum.

B. ALL OF THE FILED COMMENTS SUPPORT THE PRINCIPLE OF ADAPTIVE MODULATION.

All seven of the timely-filed, first-round comments support the principle of adaptive modulation, as outlined above.

AT&T Inc.: adaptive modulation will improve availability and reduce interruptions to data and voice communications service in underserved rural areas, where microwave systems are more likely than in urban areas to have long path lengths and face difficulties with signal fades.⁵

Clearwire Corporation: adaptive modulation will increase the company's WiMAX service reach, enhance service reliability, and increase overall link availability.⁶

DragonWave, Inc.: adaptive modulation will allow users to maximize the data-carrying capabilities of existing backhaul radio infrastructure.⁷

FWCC: adaptive modulation can significantly improve the performance and reliability of fixed microwave systems.⁸

Harris Stratex Networks: adaptive modulation dramatically increases link capacity at little or no cost, and increases availability of the link by allowing it to respond to adverse propagation conditions.⁹

⁵ AT&T Inc. at 3.

⁶ Clearwire Corporation at 2. Clearwire builds and operates next generation wireless broadband networks that provide entire communities with a robust suite of advanced high-speed Internet services.

⁷ DragonWave, Inc. at 1. DragonWave, Inc. is an industry innovator that designs, develops and manufactures carrier-grade microwave equipment offering high capacity broadband wireless systems for network operators and service providers worldwide.

⁸ Fixed Wireless Communications Coalition at 2. The FWCC is a coalition of companies, associations, and individuals interested in terrestrial fixed microwave communications.

United States Cellular Corporation: the greater reliability resulting from adaptive modulation might allow for smaller antennas and reduce the need for backup “diversity” antennas, and thus permit reduced tower loading or additional tower collocations.¹⁰

Verizon and Verizon Wireless (collectively “Verizon”), despite reservations about other aspects of the request (discussed below), nonetheless see clear benefits of adaptive modulation systems in keeping a link operational during severe fading events.¹¹

In short, all commenting parties agree on the advantages of allowing adaptive modulation.

C. THE REQUESTED INTERPRETATION WOULD SUPPORT, NOT UNDERMINE, SPECTRUM EFFICIENCY.

One commenter, Verizon, has raised the concern that the requested interpretation, without additional conditions, could result in system designs inconsistent with the Commission’s spectrum efficiency requirements.¹² Verizon cites an example in which a 6 GHz link uses a 30 MHz channel, for which the rules impose a 134.1 Mb/s minimum payload capacity.¹³ Such a link, Verizon notes, could operate at 155 Mb/s for 84 percent of the time, and reduce its data rate to a minimal 1 b/s/Hz (30 Mb/s) for the remaining 16 percent, while still attaining the required average.¹⁴ Verizon is

⁹ Harris Stratex Networks at 3. Harris Stratex Networks is the largest independent supplier of wireless transmission systems in the world.

¹⁰ United States Cellular Corporation at 3 . United States Cellular Corporation is a wireless carrier, serving approximately 6.2 million customers nationwide, operating approximately 2,350 licensed common microwave facilities.

¹¹ Verizon at 2.

¹² Verizon at 3.

¹³ 47 C.F.R. § 101.141(a)(3).

¹⁴ Verizon at 3. The 1 b/s/Hz rate is the “default” minimum for bands that have no other specific requirement. 47 C.F.R. § 101.143(a)(1).

concerned that a licensee might build a low-cost, under-designed system able to operate at full data speed only (say) 84% of the time, and using substandard modulation speeds the other 16 percent, thus achieving the required average, but with unacceptably low availability. Verizon suggests the Commission require equipment vendors to limit operating times at data rates below the values in the rules, and also specify an absolute minimum data rate.¹⁵

The FWCC shares Verizon's conviction that efficient use of the band is needed to protect spectrum for other, future users.¹⁶ But we respectfully disagree that the interpretation we seek raises new risks in that regard. The point Verizon raises, on system availability at full rated speed, addresses a separate concern not at issue here.

Part 101 has no explicit requirements for minimum availability – *i.e.*, no minimum percentage of time during which a system must satisfy the payload requirements. This matter could become the topic of a separate rulemaking proceeding, if Verizon or others believe that efficient spectrum use requires the rules to specify minimum availability. But the requested interpretation has no downward effect on availability. The only issue it raises is use of a modulation that temporarily yields a payload rate below that specified in Section 101.141(a)(3), when the microwave link would otherwise be unable to pass any traffic. (If anything, a grant of the request will *increase* full-speed availability by eliminating the downtime for resynchronization following an outage.) The FWCC is confident that other applicable rules, together with the requirement for

¹⁵ Verizon at 3-4.

¹⁶ See Verizon at 2.

good engineering practice, are sufficient to assure that systems using adaptive modulation are compliant and well designed.¹⁷

If approval of adaptive modulation allowed a system to use compliant modulations only 84 percent of the time, as in Verizon's scenario, then today, without a new ruling, an operator could lawfully operate 84 percent of the time and simply go silent the other 16 percent. Either such system, however, would violate the Commission's underlying goals and, in some cases, its requirements for good engineering practice.¹⁸ Neither one should qualify for interference protection or for licensing.

Of the dozens of radio services the Commission administers, none has a better record of consistent respect for the rules than does Part 101. The reason, we think, lies in the integrity and competence of microwave manufacturers, frequency coordinators, and operators. Every Part 101 facility is designed, acquired, installed, and operated by professionals. There are no consumer devices in these bands, no casual operators, no fly-by-night companies trading in non-compliant equipment. The operators who use the Part 101 bands, and their manufacturers and frequency coordinators, are active in policing the band themselves. There is no reason to expect this will change following grant of the requested interpretation.

¹⁷ See generally 47 C.F.R. Part 101 subpart C (technical rules on antenna standards, power limits, compliance requirements, bandwidths, frequency tolerance, etc.)

¹⁸ E.g., 47 C.F.R. §§ 101.105(c)(1), 101.109(b). The former rule cites TIA Telecommunications Systems Bulletin TSB 10-F, *Interference Criteria for Microwave Systems*, in which Section 4, *Technical Considerations for Path Design*, is dedicated to achieving high availability. Section 4.2.2 directly asks, "What performance objective(s) should be assigned to my microwave links or system?" The answer, underlined for emphasis: "In the absence of a known performance objective, 99.999% annual one-way path reliability is the per-hop default objective for frequency coordination purposes." The 84% availability system postulated in text would fail to qualify by orders of magnitude.

Because the frequency coordinators must review every Part 101 application before it reaches the Commission,¹⁹ they have traditionally played an important, albeit informal, role in enforcement. The request notes that an application must list all modulations used,²⁰ thus flagging systems that propose to use adaptive modulation. The coordinator is well positioned to evaluate whether the design will provide reasonable availability, under the circumstances of the particular installation, and to recommend needed changes to the applicant.²¹ Operators have an inherent incentive for premium systems given the required effort and cost for design, coordination, and construction. Licensees and their coordinators fully understand the importance of efficient spectrum use.

AT&T Inc. requests that applicants intending to use adaptive modulation with data speeds below those in the rules be required to so indicate in their prior coordination notices.²² The list of information now required in a prior coordination notice includes “Transmitting equipment type, its stability, actual output power, emission designator, and *type of modulation* (loading).”²³ We believe AT&T’s proposal is consistent with the present rule.

¹⁹ 47 C.F.R. § 101.103(d)(1) (“Coordination must be completed prior to filing an application for regular authorization, or a major amendment to a pending application, or any major modification to a license.”)

²⁰ 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 Ms. Marlene H. Dortch, Secretary, FCC at 4 (filed May 8, 2009) (“Adaptive Modulation Request”).

²¹ The coordinator would be on the look-out, for example, for overly long paths, non-line of sight paths, and under-sized antennas.

²² AT&T Inc. at 5.

²³ 47 C.F.R. § 101.103(d)(2)(ii) (emphasis added).

Verizon suggests unspecified restrictions to prevent low-data-rate operation from resulting in excessive interference potential to other users.²⁴ The rules on power, bandwidth, and antenna characteristics, however, will all remain unchanged. We thus see no reason to expect the interference potential to increase.

Although we think additional constraints are unnecessary, we would not oppose them, but for one important consideration. We doubt the Commission could implement Verizon's requests – particularly a time limit for slower data rates, and an absolute minimum data rate²⁵ – without a rulemaking. A proceeding on Part 101 utilization rules may indeed be appropriate, at some point. The FWCC would not oppose a rulemaking; to the contrary, we would likely become an active proponent. But such rules are not needed to grant the present request. And the industry, which needs access to adaptive modulation now, cannot afford the delay of a rulemaking on an unrelated issue.

Recent Part 101 proceedings have been exceedingly slow. The last one, on 11 GHz antennas, took 41 months from initial request to effective date.²⁶ The one before that, on rechannelizing the 18 GHz band, took 67 months!²⁷ Another rulemaking, currently underway, appears to be on a comparable trajectory: the NPRM, addressing petitions filed by the FWCC 18

²⁴ Verizon at 3-4.

²⁵ Verizon at 3-4.

²⁶ Petition for Rulemaking of FiberTower, Inc. (filed May 26, 2004); *Antenna Requirements for the 10.7-11.7 GHz Band*, 22 FCC Rcd 17153 (2007); *Amendment of the Commission's Rules To Modify Antenna, Requirements for the 10.7-11.7 GHz Band*, 72 Fed. Reg. 55673 (2007).

²⁷ Letter from Mitchell Lazarus, Fletcher, Heald, and Hildreth, P.L.C., to Marlene H. Dortch, Secretary in IB Docket No. 98-172, FCC (filed May 4, 2001); *Rechannelization of the 17.7-19.7 GHz Frequency Band for Fixed Microwave Services*, 21 FCC Rcd 10900 (2006); *Rechannelization of the 17.7-19.7 GHz Frequency Band for Fixed Microwave Services*, 71 Fed. Reg. 69039 (2006).

and 21 months ago, appeared in the Federal Register just late last month,²⁸ and is not likely to result in rules for at least another year or two. The industry should not have to endure a three-to-five year wait to use a technology that benefits manufacturers, operators, and customers, requires no change to the language of the rule, and (assuming continued good-faith compliance) has no downside.

D. THE COMMISSION’S GRANT SHOULD EMPHASIZE THE NEED FOR CONTINUED COMPLIANCE.

Despite our confidence that the current rules are adequate to prevent abuses, the FWCC supports language in the interpretation to clarify that actions of the kind that concern Verizon would constitute a violation.

The original request stated:

The parties to this letter ask the Bureau to confirm that the use of adaptive modulation is consistent with Section 101.141(a)(3). This reading permits a transmitter to *temporarily* reduce the data rate below the value in the rule *during brief periods when the link would otherwise be completely inoperative. Links would still have to comply with the minimum payload capacity in ordinary operation, and would also have to maintain the minimum on average.*²⁹

We endorse the Commission’s emphasizing the following points in a grant of the request:

- An operation that fails to maintain an average capacity that equals or exceeds the minimum in the rules is a violation of Section 101.141(a)(3).
- The link must satisfy the minimum payload capacity “in ordinary operation” – *i.e.*, during times other than “brief periods when the link would otherwise be completely inoperative.”³⁰

²⁸ *Amendment of Part 101 of the Commission's Rules*, 74 Fed. Reg. 36134 (July 22, 2009). Simultaneously with the NPRM, the Commission granted a waiver as to one of the petitions. *Amendment of Part 101 of the Commission's Rules*, WT Docket No. 09-114, Notice of Proposed Rulemaking and Order, FCC 09-58 at ¶¶ 23-24 (released June 29, 2009).

²⁹ Adaptive Modulation Request at 3-4 (emphasis added).

³⁰ *Id.*

- The link must comply with all Part 101 technical rules: power, bandwidth, antenna characteristics, out-of-band emissions, etc. for each modulation.
- Applicants intending to use adaptive modulation must so indicate in their prior coordination notices.
- The use of adaptive modulation does not relieve the licensee from satisfying all otherwise applicable rules and policies, including those as to good engineering practice and link availability, and including applicable provisions of TIA Telecommunications Systems Bulletin TSB 10-F.

The requesting parties are confident the Commission can properly include these clarifications in a grant of the request, without the need for a notice-and-comment rulemaking.³¹

CONCLUSION

The use of adaptive modulation, as set out in the original request, will improve the availability of critical fixed service links. The Commission should promptly grant the request, with the information on compliance suggested here.

Respectfully submitted,

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³¹ “Except when notice or hearing is required by statute, this subsection [requiring prior notice of rulemaking] does not apply— (A) to interpretative rules” 47 U.S.C. § 552(b). *Accord, Central Texas Tel. Coop. v. FCC*, 402 F.3d 205 (D.C. Cir. 2005) (holding a Commission order to be “interpretive,” and therefore not subject to rulemaking procedures, because it “sensibly conforms to the purpose and wording” of an earlier order, *citing Northern Ind. Pub. Serv. v. Porter County Chapter of the Izaak Walton League of Am.*, 423 U.S. 12 (1975)).

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