Before the
Federal Communications Commission
Washington DC 20554

In the Matter of	)	
	)	
Fixed Wireless Communications Coalition,	)	
Request for a Temporary Waiver of	)	No. _____
Section 101.141(a)(3) of the Commission's	)	
Rules	)	

REQUEST FOR WAIVER

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REQUEST FOR WAIVER

Pursuant to Sections 1.3 and 1.925 of the Commission's Rules, the Fixed Wireless Communications Coalition (FWCC) respectfully asks the Commission to temporarily waive Section 101.141(a)(3) to permit the use of adaptive modulation systems, as described below.[1]

A. SUMMARY

Section 101.141(a)(3) requires that certain "capacity and loading requirements must be met" as to Fixed Service equipment in the 4, 6, 10, and 11 GHz bands. These are the only bands suitable for links in the range of several miles up to tens of miles, and for that reason are critical to the Fixed Service.

Section 101.147 specifies authorized channel bandwidths. For each of those, Section 101.141(a)(3) mandates a "minimum payload capacity" expressed in megabits per second.[2] The

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[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, 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.

minimum increases with bandwidth, from 1.54 Mb/sec for a 400 kHz channel, up to 134.1 Mb/sec for 30 MHz and 40 MHz channels.

The industry has generally construed these payload requirements as applying whenever the link is in service. For example, where the rule specifies a minimum capacity of 134.1 Mb/sec, the industry has taken this to mean the link must be able to send at least 134.1 million bits during each and every second that the link is in operation and considered available.

The waiver we request here would apply a different reading, one still consistent with the language of the rule: that lower data rates be permitted during brief periods when the link would otherwise be temporarily out of service, such as during short, atmospherically-induced decreases in received signal strength. The data rate will still comply with the minimum during normal operation, and will also comply on average.

The requested waiver will provide for more consistently reliable service, while adhering to both the letter and the purpose of the rule, and will not disadvantage any party. The waiver is therefore in the public interest.

B. PROCEDURAL NOTE

A year ago, on May 8, 2009, the FWCC and others filed a "Request for Interpretation" of the Commission's Rules that made the same request as we do here, but framed as a request for rule interpretation rather than for a waiver.[3] The Commission put the request on public notice[4]

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[2] For bandwidths of 10 MHz and above, the rule also requires that the channel be loaded to 50% of capacity within 30 months of licensing. That provision is not at issue here.

[3] 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, WT Docket No. 09-106 (filed May 8, 2009).

and drew mostly favorable comments. The Commission's next public reference to the matter was a passage in *The National Broadband Plan*, which mentioned adaptive modulation under the heading, "The FCC should revise its rules to allow for greater flexibility and cost-effectiveness in deploying wireless backhaul."[5] The relevant passage reads:

> The FCC should consider modifying rules on minimum data throughput for each authorized microwave channel when the benefits are clear. Several parties have noted the potential benefits of using adaptive modulation in rural areas to expand the range of backhaul systems. Adaptive modulation is a technique whereby the data rate is dynamically adjusted based on channel conditions at any moment in time. All of these changes could potentially reduce operational costs, particularly in rural areas where microwave backhaul is essential to providing broadband service.[6]

The passage cites the above-mentioned Request for Interpretation, the Commission's public notice, and two subsequent filings by the FWCC.[7]

Not surprisingly, we agree with the substance of the passage. Our only problem is with the timing of relief. Adaptive modulation is needed urgently. If the Commission plans to turn down our earlier Request for Interpretation in favor of initiating a rulemaking, as the passage suggests, that would likely postpone relief for at least a year or two, and possibly longer.[8]

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4 *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*, 24 FCC Rcd 8549 (2009).

5 *Connecting America: The National Broadband Plan*, Recommendation 5.10 at 93 (released March 16, 2010).

6 *Id*. at 93-94 (citation endnote omitted).

7 *Id*. at 104 n.127.

8 Recent Part 101 rulemakings have taken anywhere from 30 to 66 months. *See* Comments of Mitchell Lazarus in GN Docket Nos. 09-157, 09-51 at 5 (table) (filed Sept. 30, 2009) (updated for still-open proceedings).

The FWCC accordingly files the present request for waiver pending the completion of a rulemaking on the subject. The combination of urgent need and lack of adverse consequences favors a prompt waiver. We acknowledge that the Commission may require retrofitting of equipment installed under the waiver, if it ultimately decides not to authorize adaptive modulation.

C. NEED FOR WAIVER

A Fixed Service link is designed to achieve a specific availability objective: *i.e.*, the percentage of time the link may be relied upon for its designed throughput. During the fraction that the link is predicted to be unavailable, the throughput is assumed to be zero. For example, a link designed for 99.999% ("five nines") availability is expected to be out of service, on average, not more than 0.001% of the time, or about five minutes over the course of a year. Links for critical applications are routinely designed to this or higher levels of availability.

Fixed Service links, especially long links, are subject to atmospheric "fading" – a temporary drop in received power caused by changes in propagation conditions. Fades may lead to an increase in bit errors, and at some depths to a complete break in communication. Links in the Fixed Service therefore require a normal receive signal level with sufficient margin above the receiver's threshold to mitigate effects of atmospheric fades. When a fade exceeds this margin, link communications are lost, and resume only when the fading condition subsides. Some systems require re-synchronization, so the interruption in payload communications can extend for many minutes after the fade.

An additional way to combat fades is by briefly reducing the data rate. This requires a temporary change in the type of modulation, a process called "adaptive modulation." Reducing the data rate maintains communication because receivers can accept a weaker incoming signal

when the bit rate is lower.[9] This allows the bit stream to continue in the event of a fade, albeit at a lower data rate. Adaptive modulation also maintains system synchronization and eliminates the possible need for down-time to "reboot," which often takes twenty minutes or longer.

The use of adaptive modulation may reduce the link capacity below the value specified in the rule for a short time, although this still represents a significant increase over the otherwise zero level during the fade. Even with adaptive modulation in use, the average bit rate over time can be made to exceed the minimum. Most modern digital radios routinely operate at well above the minimum required capacity, and most deep fades are of short duration. For example, digital radios occupying a 30 MHz channel at 6 GHz typically operate at about 155 Mbps, a 16% excess over the required 134.1 Mbps. In a properly designed system, fading conditions that might trigger adaptive modulation occur well under one percent of the time. Thus, even under pessimistic assumptions, a system employing adaptive modulation will comfortably achieve the minimum on average.

D. REQUEST FOR WAIVER

The FWCC asks the Commission to waive Section 101.141(a)(3) subject to the following conditions:

- Links must comply with Section 101.141(a)(3) in ordinary operation.
- An operator can drop below Section 101. 141(a)(3) levels only briefly, and only when necessary, as when needed to maintain communications through an atmospheric fade.
- Average bit rates over time must comply with Section 101.141(a)(3).

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[9] An analogy: when talking to someone in a noisy room, or shouting over a distance, we instinctively speak more slowly. We know from daily experience that a slower message is more likely to get through. The same principle applies to data carried via radio: other things being equal, slowing the data rate makes communications more reliable.

When the Commission completes a rulemaking on adaptive modulation, it can require operators to bring waivered systems into compliance with the outcome.

The requested waiver will have no effect on any other rules, including those relating to antenna standards, transmitter power, spectrum occupancy, channel loading, frequency coordination, and so forth. To the contrary, the FWCC endorses continued adherence to high engineering standards for system design and frequency planning in the Fixed Service, so as to minimize any potential for abuse and ensure effective sharing of spectrum.

E. PUBLIC INTEREST

The requested waiver amounts to reading the requirements of Section 101.141(a)(3) as average values, rather than instantaneous values. This is fully consistent with the wording. The waiver also fully maintains the purpose of the rule by enhancing spectrum efficiency. It allows for the continued handling of critical traffic when the link would otherwise be inoperative. And it preserves network synchronization through a fade, eliminating additional minutes of outage that can threaten real-time applications such as public safety backhaul, electric grid and pipeline control, and cell site backhaul. As noted, performance on average will equal or exceed the minimum.

The waiver also serves the public interest because it enables the spectrum to carry more capacity than the minimum required, and still provide high-quality voice and critical time-sensitive services. The higher capacity is achieved through the use of higher modulation during unfaded periods, and higher availability for voice and other time sensitive services through the use of lower modulation during faded periods.

In brief, adaptive modulation improves reliability, increases spectrum usage and efficiency, and accommodates evolving uses of microwave radio. The requested waiver of the current rule Section 101.141(a)(3) is therefore unquestionably in the public interest.[10]

F. LEGAL STANDARDS

The Commission assesses waiver requests according to the standards set out in *WAIT Radio v. FCC*.[11] In that case, as here, the applicant sought to operate in contravention of the rules while explaining how it would nonetheless accomplish the purpose of the rules.[12] The court required the Commission to consider the request:

> [A] general rule, deemed valid because its overall objectives are in the public interest, may not be in the "public interest" if extended to an applicant who proposes a new service that will not undermine the policy, served by the rule, that has been adjudged in the public interest.[13]

The plain meaning is clear: Waiver is appropriate where the applicant furthers the public interest inherent in the underlying rule.

The waiver requested here precisely meets the *WAIT Radio* standard: it proposes a "new service" that will not undermine the policy served by the rule. To the contrary, adaptive

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[10] Industry Canada has approved adaptive modulation under the same conditions requested here. ETSI, the standards development body for the European community, has also approved adaptive modulation under the name "mixed-mode," and a number of European administrations have likewise approved its use. The FWCC will document these developments on request.

[11] 418 F.2d 1153 (D.C. Cir. 1969). *See also*, *2002 Biennial Regulatory Review*, 18 FCC Rcd 13620 at ¶ 85 n.130 (2003) (citing *WAIT Radio* as "setting out criteria for waivers of Commission rules.")

[12] WAIT Radio operated an AM broadcast station. It was limited to daylight hours so as to afford protection to "white areas" that had no local service, and that relied on nighttime skywave propagation from another station. WAIT Radio proposed to transmit at night using a directional antenna that would limit its signal in the white areas. *WAIT Radio v. FCC*, 418 F.2d at 1154-55.

[13] *WAIT Radio v. FCC*, 418 F.2d at 1157.

modulation will provide the added benefits of improved reliability and higher overall speeds in fixed service communications, with no downside to anyone. The requested waiver fits easily into the boundaries drawn by *WAIT Radio*.

The Court of Appeals emphasized the importance of waiver procedures as part of the regulatory scheme:

> The agency's discretion to proceed in difficult areas through general rules is intimately linked to the existence of a safety valve procedure for consideration of an application for exemption based on special circumstances.[14]

Thus, it said, "allegations such as those made by petitioners, stated with clarity and accompanied by supporting data . . . must be given a 'hard look.'"[15]

Here, too, the request fully qualifies. The "safety valve" of the waiver procedure is needed to make available an important system management tool that will reduce outage time. The requested waiver is in the public interest, not only in terms of benefits to the public through improved reliability and spectrum efficiency, but also in the utter absence of disadvantages. The request is entitled not only to the "hard look" mandated in *WAIT Radio,* but to a grant of the waiver.

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14 *Id.*

15 *Id.* (citation footnote omitted).

CONCLUSION

The Commission should waive Section 101.141(a)(3) to the extent of permitting data rates to drop for brief periods below the values in the rule under the conditions described above, so long as the values in the rule are maintained both in normal operation and on average.

Respectfully submitted,

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