

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

In the Matter of	)	
	)	
Revision of Part 15 of the Commission's	)	
Rules to Permit Unlicensed National	)	ET Docket No. 13-49
Information Infrastructure (U-NII) Devices	)	
in the 5 GHz Band	)	

**COMMENTS OF FASTBACK NETWORKS**

CBF Networks, Inc. (d.b.a. "Fastback Networks") supports the general proposals set out in the Notice of Proposed Rulemaking (the "NPRM") in the above-referenced proceeding,<sup>1</sup> subject to specific technical concerns as noted herein.

In the NPRM, the Commission proposes to make two broad sets of changes to the rules governing the operation of unlicensed devices in the 5 GHz band (5150-5925 MHz). First, the Commission proposes to harmonize the rules for Part 15 devices operating in the 5150-5350 and 5470-5850 MHz bands under a revised set U-NII band rules. Second, the Commission proposes to expand the U-NII band to include 5350-5470 and 5850-5925 MHz with rules similar to those of the revised U-NII band. Together, these actions are intended to encourage the "development of new and innovative unlicensed devices, and increase wireless broadband access and investment."<sup>2</sup>

Fastback Networks believes that many of the proposals set forth in the NPRM will facilitate increased innovation and competition in the development and use of broadband wireless networking technologies at 5 GHz. Fastback Networks, therefore, supports these proposals in principle and urges the Commission to adopt them as soon as possible, subject to specific technical concerns as noted herein. In particular, as discussed in further detail below, Fastback Networks urges the Commission not to adopt restrictions on antenna gains and restrictions on emissions that would hinder wireless internet service providers ("WISPs") from providing broadband services in under- and unserved rural and other remote areas.

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<sup>1</sup> *Revision of Part 15 of the Commission's Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz Band*, Notice of Proposed Rulemaking, ET Docket No. 13-49, FCC 13-22 (rel. Feb. 20, 2013) ("NPRM").

<sup>2</sup> NPRM at ¶2.

## BACKGROUND AND STATEMENT OF INTEREST

Former executives of Proxim, Inc., Kevin Negus and Kevin Duffy, founded Fastback Networks in 2010. The Chief Technology Officer of Fastback Networks, Dr. Negus, is also a former member of the FCC Technological Advisory Council under Chairman Michael Powell and a former member of the Wyoming Telecommunications Council. Fastback Networks develops extremely high speed outdoor wireless networking products that connect metropolitan area fiber optic networks to broadband access points such as commercial buildings, cellular base stations or WiFi hotspots. Many of Fastback Networks' products are designed for operation in the 5 GHz band in the USA and many other countries around the world. More information on Fastback Networks is available at [www.fastbacknetworks.com](http://www.fastbacknetworks.com).

Fastback Networks is a U.S. company based in San Jose, CA. Fastback Networks' products embody many open standards including those promulgated by the IEEE, the IETF and the Metro Ethernet Forum.

In light of the above, Fastback Networks and its customers have a direct interest in regulatory changes that enhance competition and opportunity in the 5 GHz band.

## DISCUSSION

### **I. THE COMMISSION SHOULD MOVE FORWARD WITH ITS PROPOSED CHANGES TO THE RULES GOVERNING 5 GHz DEVICES IN EXISTING BANDS SUBJECT TO COMMENTS HEREIN.**

#### **A. The Upper Edge of the U-NII-3 Band Should be Extended from 5825 to 5850 MHz.**

The NPRM seeks comments on the proposal to extend the upper edge of the U-NII-3 band from 5825 to 5850 MHz to match the amount of spectrum available for digitally modulated devices under Section 15.247.<sup>3</sup>

Fastback Networks supports this change exactly as proposed. Fastback Networks believes the costs associated with this change are small and will be born entirely upon U-NII device manufacturers. The benefits far exceed the costs by leading to additional spectrum under the U-NII-3 band rules as well as avoiding the unnecessary expense associated with simultaneous certification under U-NII and 15.247 regulatory regimes.

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<sup>3</sup> NPRM at ¶ 27.

**B. The U-NII-3 Band Rules Should be Modified to Include Digitally Modulated Devices in the 5725-5850 MHz Band.**

The NPRM seeks comments on its proposal to remove the 5.725-5.85 GHz band for digital modulation devices from Section 15.247 and to consolidate all equipment authorizations for digitally modulated devices in the 5.725-5.85 GHz band under the U-NII rules, while maintaining many of the technical rules that currently make equipment authorization under Section 15.247 more attractive for equipment manufacturers.<sup>4</sup>

Fastback Networks agrees that the Commission's existing rules for 5725-5850 MHz under either U-NII or 15.247 rules for digitally modulated devices is unnecessarily duplicative if the U-NII-3 upper band edge is extended. Under the current rules, products that have accessed multiple bands at 5 GHz have advantageously been certified under U-NII for 5150-5350 and 5470-5725 MHz and under 15.247 for 5725-5850 MHz. The Commission's proposed change in this regard per the NPRM will enable device manufacturers to certify under U-NII rules only. There are no appreciable costs due to this change and what small costs exist will be born entirely upon U-NII device manufacturers. The benefits far exceed the costs by avoiding the unnecessary expense associated with simultaneous certification under U-NII and 15.247 regulatory regimes. However, as discussed below in Section I.C, Fastback Networks opposes any changes to the antenna gain requirements as proposed in ¶ 33 of the NPRM.

Fastback Networks supports all of the Commission's proposed changes specifically as set forth in ¶¶ 29-35 of the NPRM.

**C. The Commission Should Keep the Section 15.247 Rules in the U-NII 3 Band.**

Fastback Networks generally supports the Commission's proposed changes to U-NII-3 to encompass the 15.247 digitally modulated device rules of 5725-5850 MHz. These changes, with appropriate revisions as discussed below, will benefit U.S. businesses and consumers while improving overall spectrum efficiency and minimizing interference by devices sharing the U-NII-3 band.

However, Fastback Network opposes the proposed changes to the antenna gain requirements described in ¶ 33 of the NPRM. The antenna gain requirements in place today have permitted WISPs around the country to provide broadband services to under- and unserved rural and other remote areas. Restricting the antenna gain as proposed would harm broadband deployment in these hard-to-serve areas, a result that is directly contrary to the important policy of promoting broadband deployment to all Americans. Instead, the Commission can address interference concerns by ensuring that equipment manufacturers include appropriate security measures that prevent the

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<sup>4</sup> NPRM at ¶¶ 28-35.

modification of equipment, thereby ensuring that operations in the band comply with the Commission's technical rules designed to prevent interference.

In particular, Fastback Networks believes that the rules that allow for increased antenna gain (or increased maximum EIRP) for fixed point-to-point systems should be partially extended to professionally-installed fixed point-to-point systems where a professionally-installed common aggregation end fixed transmitter communicates with a small number of professionally-installed remote end fixed receivers.

Under the current rules of 15.247 or the proposed revised rules for U-NII-3, deployments of fixed point-to-point systems with a common fixed aggregation end shared amongst multiple fixed remote ends is considered a "multipoint" system and subject to the maximum +36 dBm EIRP transmit power limitation wherein use of greater than 6 dBi antenna gain requires 1 dB reduction in power required for every 1 dB that gain exceeds 6 dBi. This encourages such deployments to be made with a separate co-located aggregation end device for every remote end device such that this maximum +36 dBm EIRP transmit power limitation does not apply either individually or in aggregate across such multiple co-located transmitters. It also permits each remote end to transmit at much higher than this maximum +36 dBm EIRP transmit power limitation since each remote end becomes part of a separate fixed point-to-point system. This leads to unnecessary additional transmit energy in the 5725-5850 MHz as well as additional cost for multiple aggregation end devices and installations.

Fastback Networks believes that partial accommodation for EIRP higher than +36 dBm at a common aggregation end only of professionally-installed fixed point-to-point systems where a professionally-installed common aggregation end fixed transmitter communicates with a small number of professionally-installed remote end fixed receivers is justifiable because such a common aggregation end can advantageously reduce costs and interference simultaneously compared to multiple co-located fixed point-to-point systems. In particular, Fastback Networks recommends that the Commission modify the U-NII-3 band rules to allow an assumed antenna gain of  $[6 \text{ dBi} + 10 \log (N_{\text{remotes}})]$  up to a maximum of 12 dBi (or  $N_{\text{remotes}}=4$ ) before requiring a 1 dB reduction in maximum power required for every 1 dB that the actual antenna gain exceeds the lesser of either this  $[6 \text{ dBi} + 10 \log (N_{\text{remotes}})]$  limit or 12 dBi. Note that this would leave the maximum power specified at +30 dBm (or +17 dBm/MHz at 20 MHz channel bandwidth) and would not affect 6 dBi assumed gain at the remote end devices.

**D. The U-NII-1 Band Rules Should be Modified to Remove the “Outdoor” Operation Restriction and to be Harmonized with the U-NII-3 Band Depending on the Device Type**

The NPRM seeks comments on a proposal to change the existing 5150-5250 MHz U-NII-1 band rules in harmony with one or both of the U-NII-2A band rules or the U-NII-3 band rules as well as a proposal to eliminate the restriction on outdoor operation.<sup>5</sup>

Fastback Networks generally supports the Commission’s proposals with respect to harmonization of U-NII-1 band rules but with requested clarifications and with recommendations as follows to mitigate interference with incumbent services.

Fastback Networks fully supports removing the restriction on outdoor operation. Despite the best intentions of all involved in the industry during the 15+ years since U-NII-1 was created, the difficulty of enforcing the outdoor restriction for most products has proven insurmountable. By any reasonable measure, laptop computers, tablets, phones, and most commercial access points can be considered “indoor” devices because they generally lack the environmental hardening that is necessary for an “outdoor” device. Yet it is clear that millions of these devices are routinely operated outdoors in the USA with 5 GHz transmissions including the U-NII-1 band. There is no practical way for device manufacturers to credibly enforce the indoor-only restriction and so compliance is inevitably left to consumers. Thus, Fastback Networks believes that incumbent services are not protected currently by the fiction of an unenforceable indoor restriction and further that device manufacturers and their customers are not served by continuing to attempt such an unenforceable indoor restriction.

Fastback Networks believes, however, that the Commission can reasonably impose limits on the type of device accessing the U-NII-1 band into at least two categories that can be certified differently to allow maximal utility for the U-NII-1 band while continuing to mitigate interference with incumbent services. Fastback Networks suggests that these two device type categories be called “professionally-installed fixed devices” and “transportable devices”. The key distinction between the two categories is that the “professionally-installed fixed devices” must be designed, certified and installed such that their maximum EIRP in an upward pointing direction that may affect satellite receivers does not exceed a prescribed limit. The “transportable devices”, which would be defined as anything not qualifying under “professionally-installed fixed devices”, are not so certified and cannot be assumed to be always oriented to minimize interference in an upward pointing direction that may affect satellite receivers. Thus the “transportable devices” should have a maximum EIRP in any direction that also does not exceed this same prescribed limit.

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<sup>5</sup> NPRM at ¶¶ 36-41.

For the “transportable devices” category, Fastback Networks recommends that the Commission restrict the maximum EIRP to a prescribed limit of 200 mW or +23 dBm (or +10 dBm/MHz). Fastback Networks suggests that the conducted output power limit for such “transportable devices” be limited to 50 mW at a peak power spectral density of 2.5 mW/MHz as per current U-NII-1 band rules. However, Fastback Networks accepts that it may be completely reasonable to allow a higher conducted output power limit for such “transportable devices” so long as the maximum EIRP of 200 mW is demonstrated. In effect, from an interference viewpoint, this amounts to maintaining the status quo for “transportable devices” under U-NII-1 but ending the unenforceable restriction on outdoor operation and the inconvenience of different rules for such device across U-NII-1 and U-NII-2. Given the reality that millions of devices likely have already operated outdoors in U-NII-1 under this proposed 200 mW EIRP limitation, it would seem that co-existence with incumbent services has already been demonstrated.

For the “professionally-installed fixed devices,” which could include such products as fixed WiFi hotspot access points and fixed broadband outdoor links for backhaul or residential/commercial access, Fastback Networks believes that these devices should be allowed to operate under a set of U-NII-1 rules harmonized with U-NII-3 rules as the Commission has proposed in the NPRM.<sup>6</sup> However, the Commission should add the restriction that such “professionally-installed fixed devices” must be designed, certified and installed such that their maximum EIRP at any elevation angle greater than 45 degrees above the horizon be less than the same prescribed limit of existing U-NII-1 devices of 200 mW or +23 dBm (or +10 dBm/MHz).

Fastback Networks also requests that in adopting harmonized U-NII-1 and U-NII-3 band rules for “professionally-installed fixed devices,” the Commission include the same technical rules as proposed in the NPRM for the modified U-NII-3 band rules, with the exceptions with respect to antenna gain discussed above.<sup>7</sup>

**E. The Commission Should Not Adopt Mitigation Requirements for TDWR that Impair Operation of Devices in U-NII Bands Outside of 5600-5650 MHz**

The NPRM seeks comments on multiple topics relevant to harmful interference between 5 GHz transmitters and critical TDWR installations.<sup>8</sup>

As discussion within the NPRM highlights, most cases of harmful interference with TDWR installations occur due to equipment that by design inadequately prevents operation at uncertified frequencies and/or that by installation is set to operational

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<sup>6</sup> NPRM at ¶ 40.

<sup>7</sup> NPRM at ¶¶ 33-35.

<sup>8</sup> NPRM at ¶¶ 42-65.

modes not allowed by the manufacturer. Fastback Networks completely agrees with the Commission that such “interference is unacceptable and must be eliminated, given the public safety risks”.<sup>9</sup>

Fastback Networks agrees with the Commission that manufacturers should be required to certify that “modifying or reconfiguring firmware or software will make a device inoperable in certain bands” such as 5600-5650 MHz. Fastback Networks further agrees that manufacturers should be required “to secure the software in their radios to prevent modifications by third parties” and invites the Commission to codify this revised U-NII band rules.

Fastback Networks believes that requiring equipment manufacturers to include security features that prevent modification or alteration of the devices as proposed in the NPRM is sufficient to address any interference concerns. Should the Commission nevertheless decide to adopt other TDWR mitigation techniques such as transmitting identifying information, expanding DFS detection bandwidth or accessing geo-location databases, Fastback Networks believes that any such requirements should be optional if a manufacturer can show that its device has been prevented from transmitting in 5600-5650 MHz.

Fastback Networks also recommends that the Commission not adopt a distinction in the out-of-channel emission limits between “indoor” and “outdoor” devices. First, that an “indoor” device may likely be “lower power” compared to an “outdoor” device is of no moment given the reality that “indoor” devices inevitably end up operated outdoors by consumers at some point and thus their full emissions will be experienced by other users of the band including TDWR installations. Second, while it is straightforward to define “indoor” and “outdoor”, it is virtually impossible to enforce it because compliance will ultimately be in the hands of consumers. Given that the “indoor” devices will be much more prevalent than the “outdoor” devices and that such “indoor” devices will end up operating in these bands outdoors, it makes no sense to permit such “indoor” devices to have substantially higher out-of-channel emission limits.

The Commission suggests that an alternative distinction for basing emissions limits be simply the output power level of “lower power” versus “higher power”. However, Fastback Networks believes that requiring “lower emissions” in combination with “higher power” is not a sensible mitigation technique if it is the “emissions,” not the “power,” that is the allegedly harmful effect. Thus, Fastback Networks strongly implores the Commission to continue its current policy, which is in concurrence with the policies of other countries that authorize devices in this same band, of treating all transmitters equally in terms of unwanted emission limits independent of their intended application or maximum power level.

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<sup>9</sup> NPRM at ¶ 42.

Fastback Networks is particularly concerned about the suggestion of imposing a -41 dBm/MHz “out-of-channel” emissions limit, suggested in various places within the NPRM for “outdoor” or “higher power” devices. Fastback Networks believes that this limit will be extremely difficult to meet with any practical commercially available components. Such a limit can be met today, with great difficulty, by outdoor products operating above 250 mW EIRP for out of band emissions into “quiet bands” that require -41 dBm/MHz, but only through the use of “guard channels” that are used effectively as a filter transition channel even though still within the certified transmit band. However, if -41 dBm/MHz applies to “out-of-channel” emissions rather than “out of band” emissions, then such “guard channels” will by definition be “out-of-channel” and thus even the most sophisticated devices available today will significantly exceed the proposed new limit of -41 dBm/MHz.

Fastback Networks strongly encourages the Commission to continue using the unwanted emissions limit currently in place of -27 dBm/MHz for “out-of-channel” emissions within any U-NII-2 band independent of whether or not a particular device is “indoor” or “outdoor” or “lower power” or “higher power”. Note that this approach is consistent with analogous rules in other regulatory domains such as Canada and Europe.

**F. The Commission Should Adopt Its Other Recommend Changes to the U-NII-2A and U-NII-2C Bands and Consider the Additional Input Given Herein**

The NPRM also seeks comments on topics such as DFS topology, DFS functionality, DFS sensing threshold, testing procedures and uniform spreading that are relevant to existing rules for the U-NII-2A and U-NII-2C bands.<sup>10</sup>

Fastback Networks supports the Commission’s proposal that “any U-NII device that is subject to the DFS requirements in Section 15.407 that is capable of initiating a network must have radar detection functionality and must be approved with that capability.”<sup>11</sup> Fastback Networks does not believe this adds any cost for manufacturers or users of these bands and that this will help mitigate interference to incumbent Federal radar systems.

The Commission also solicits comments on how existing DFS requirements have affected devices in these bands particularly for “wider bandwidth devices.”<sup>12</sup> Fastback Networks believes that the existing DFS rules impede delivery of high reliability broadband services in these bands that could otherwise be possible through improved

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<sup>10</sup> NPRM at ¶¶ 66-74.

<sup>11</sup> NPRM at ¶ 69.

<sup>12</sup> NPRM at ¶ 70.

technology if at least two simple optional changes were made to the DFS procedures that Fastback Networks believes would not harm incumbent users.

First, Fastback Networks believes that, especially with wider bandwidth devices, DFS detection within a channel should not require the device to vacate the entire channel to the extent that the manufacturer can optionally certify to the Commission that its DFS detection capability can identify the specific frequency range at which the detected radar is operating with sufficient accuracy. Similarly, to the extent that such a DFS detector identifies the specific frequency range of the detected radar, the Non-occupancy period should apply only to that range and not to the entire channel that the device had been operating in. Although most DFS detectors today do not have this capability, so long as the DFS rules provide no optional benefit in this regard, then there will be no incentive to develop such capability and hence no ability to use this capability to more efficiently maximize the beneficial usage of spectrum resources in these bands. Fastback Networks believes that such an optional “sub-channel” DFS detection capability will benefit all users of these bands especially as more and more of these wider bandwidth devices are deployed.

Second, Fastback Networks believes that the Commission should permit devices that can optionally certify the capability to detect incumbent radars per existing requirements and to simultaneously check alternate channels or channel ranges on a partial duty cycle basis. More specifically, if such devices do not detect radar within such alternate channels or channel ranges within a time period greater than some multiple of the Channel Availability Check Time divided by the partial duty cycle fraction, then such devices should be permitted to move to such an alternate channel immediately upon DFS detection in its current channel. This would greatly minimize disruption of service for critical broadband services in the event that DFS radar detection occurs.

Fastback Networks believes that the costs associated with developing the two optional capabilities recommended above will be incurred only by U-NII device manufacturers and only if such manufacturers choose to take advantage of these proposed optional DFS modalities.

Fastback Networks supports the Commission’s proposal that “devices must operate with both an EIRP of less than 200 mW (23 dBm), and an EIRP spectral density of less than 10 dBm/MHz (10 mW/MHz), in order to use the relaxed sensing detection threshold of -62 dBm.”<sup>13</sup> Fastback Networks does not believe any significant costs will be incurred by any party associated with such a change and that the benefits to all users will be improved co-existence with incumbent Federal radar systems.

Fastback Networks has not yet completed its analysis to either support or oppose

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<sup>13</sup> NPRM at ¶ 72.

the Commission's proposal to adopt revised DFS measurement procedures as described in Appendix B to the NPRM.<sup>14</sup>

Fastback Networks supports the Commission's proposals "to remove the "Uniform Channel Spreading" requirement from our rules and measurement procedures" and "to permit either random channel selection or manual selection of the initial channel."<sup>15</sup> Fastback Networks also believes the Commission should "permit a device to create a master list of available channels that it would use if they continue to be available." Fastback Networks believes that these proposals will not negatively impact spectrum re-use but rather will enable devices to autonomously use spectrum resources for maximum efficiency. Fastback Networks further believes that measurements should be conducted with a channel-loading requirement that corresponds to the maximum manufacturer advertised throughput for the device being certified. Any number of commercially available tools or equipment, such as for example only, jperf, Chariot, or RFC2544, may be used to generate such channel loads as applicable to the particular device type.

**II. THE COMMISSION SHOULD ADOPT THE PROPOSED U-NII-2B AND U-NII-4 BAND RULES AS PROPOSED SUBJECT TO COMMENTS HEREIN.**

**A. The Commission Should Allocate the U-NII-2B and U-NII-4 Bands Expeditiously**

Fastback Networks applauds the Commission for proposing the creation of the U-NII-2B and U-NII-4 bands under the general rules described in the NPRM, subject to comments herein.<sup>16</sup> Fastback Networks believes that rapid adoption of these additional 5 GHz bands will spur innovation, job creation and broadband services for all residents of the USA.

**B. The Commission Should Adopt the Proposed U-NII-2B Band Rules Subject to Specific Changes Provided Herein**

Fastback Networks believes the Commission's general proposal to harmonize the U-NII-2B band rules with that of U-NII-2A and -2C is a sound approach.<sup>17</sup>

However, Fastback Networks strongly implores the Commission not to impose an out-of-channel emissions limit of -41 dBm/MHz for any device, whether "indoor" or "outdoor," in this band as it will severely restrict the utility of devices in this band for the same reasons described elsewhere in these comments. As Fastback Networks has

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<sup>14</sup> NPRM at ¶ 73.

<sup>15</sup> NPRM at ¶ 74.

<sup>16</sup> NPRM at ¶¶ 75-77.

<sup>17</sup> NPRM at ¶ 96.

noted above, this -41 dBm/MHz out-of-channel emissions limit is inconsistent with the practice in other countries as well as under existing U-NII band regulations in the USA.

Fastback Networks proposes that the U-NII-2B band be subject to the same DFS procedures, subject to the Fastback Network proposed enhancements described above, as the U-NII-2A band.

### **C. The Commission Should Adopt the Proposed U-NII-4 Band Rules**

Fastback Networks fully supports the Commission's proposal to harmonize the U-NII-4 band rules with those of the proposed revised U-NII-3 band rules.<sup>18</sup>

Fastback Networks recommends that the U-NII-4 band not be subject to any DFS requirements as consistent with the U-NII-3 band.

### **CONCLUSION**

For the reasons stated above, Fastback Networks urges that the Commission promptly adopt the proposals set forth in the NPRM, subject to specific technical concerns as noted herein. This action will serve the public interest by promoting flexible, efficient, and equitable access to the 5 GHz band by both existing and new unlicensed devices for a myriad of beneficial uses.

Respectfully submitted,

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<sup>18</sup> NPRM at ¶ 97.