

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

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

**COMMENTS OF MOTOROLA SOLUTIONS, INC.**

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Motorola Solutions, Inc. (“MSI”) hereby submits the following comments in response to the Federal Communications Commission’s (“Commission”) Notice of Proposed Rulemaking on revisions to the Unlicensed National Information Infrastructure (“U-NII”) rules for devices operating in the 5.150-5.925 GHz (“5 GHz”) band.<sup>1</sup>

**I. INTRODUCTION AND SUMMARY**

MSI supports efforts to harmonize the operational rules applicable to the 5 GHz U-NII bands, and to make new segments of the 5 GHz band available for unlicensed use. The proposals in the Notice will facilitate the introduction and deployment of innovative unlicensed technologies by creating a contiguous unlicensed band stretching across much of the 5 GHz spectrum, with significant efficiencies and uniformity in regulatory treatment.

The Commission should adopt its proposals to harmonize the regulatory treatment of existing 5 GHz unlicensed operations. Specifically, the Commission should apply uniform rules to all similar unlicensed devices operating in the 5.725 GHz to 5.850 GHz band segment, and bring those devices under the Section 15.407 U-NII-3 rules. The Commission should also adopt

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<sup>1</sup> See Revision of Part 15 of the Commission’s Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz Band, ET Docket No. 13-49, *Notice of Proposed Rulemaking*, 28 FCC Rcd 1769 (2013) (“Notice”).

its proposal to harmonize the rules applicable to the 5.150-5.250 GHz (“U-NII-1”) band with the U-NII-3 rules, as revised, including by raising the transmitter power limit for U-NII-1 devices to 1 watt, and eliminating the restriction on outdoor operations.

MSI agrees that unauthorized operation of U-NII devices poses a potentially serious problem. However, ensuring that transmitters are secured from being programmed in ways that exceed their authorized operation would be the most cost-effective approach to ensuring the mitigation of interference to incumbent users in the 5 GHz bands. Therefore, the Commission should not mandate more complex interference mitigation techniques, such as geo-location or increased sensing capabilities, which are unneeded and would only add complexity and cost to devices in what is already a highly competitive and low-cost marketplace.

Finally, MSI supports the Commission’s proposals to open up new segments in the 5 GHz band for unlicensed use. Expanding access to additional portions of the 5 GHz band under rules harmonized with the 5 GHz bands already available for unlicensed operation would open up a variety of new services and applications, particularly as new technologies based on IEEE 802.11ac are developed.

## **II. THE COMMISSION SHOULD HARMONIZE RULES FOR THE EXISTING U-NII BANDS.**

Harmonizing and streamlining the operational rules applicable to the existing U-NII bands will reduce complexity and cost in equipment design, and promote the introduction of new and innovative technologies leveraging the substantial unlicensed bandwidth available in the 5 GHz spectrum. To that end, the Commission should adopt its proposals to extend the U-NII-3 band and to harmonize treatment of U-NII-1 with U-NII-3 devices. The Commission also should avoid the imposition of unnecessarily burdensome new security features for U-NII devices.

**A. The Commission Should Expand and Improve the U-NII-3 Rules.**

The Commission should apply uniform treatment to the 5.725-5.850 GHz band under the U-NII-3 rules, as proposed in the Notice.<sup>2</sup> Currently, there are unnecessary and inefficient differences between the operational rules applied to 5.725-5.825 GHz U-NII devices authorized under Section 15.407 of the Commission’s Rules and digital devices operating in the 5.725-5.850 GHz band under Section 15.247.<sup>3</sup> As the Commission notes, this disparity introduces unwanted complexity to the equipment authorization process, and raises potential interference concerns.<sup>4</sup> MSI therefore supports the Commission’s proposal to extend the upper edge of the U-NII-3 band segment from 5.825 GHz to 5.850 GHz and to remove the 5.725-5.850 GHz band from Section 15.247.<sup>5</sup>

To implement this new regulatory scheme, the Commission should create a single set of rules under Section 15.407 to cover the entire U-NII-3 band, as proposed in the Notice.<sup>6</sup>

Specifically, MSI agrees that U-NII-3 devices should be subject to:

- 1 watt power limit without the bandwidth dependent 17 dBm + 10 log B limitation;
- Maximum power spectral density (“PSD”) of 8 dBm/3 kHz (33 dBm/MHz);
- Minimum 6 dB bandwidth of 500 kHz;
- Maximum antenna gain of 23 dBi for fixed point-to-point systems;
- Unwanted emissions limits of -17 dBm/MHz within 10 MHz of the band edge, and -27 dBm/MHz beyond 10 MHz of the band edge; and

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<sup>2</sup> Notice ¶¶ 26-35.

<sup>3</sup> Compare 47 C.F.R. § 15.247 with 47 C.F.R. § 15.407.

<sup>4</sup> Notice ¶ 25.

<sup>5</sup> *Id.* ¶¶ 27-28.

<sup>6</sup> *Id.* ¶¶ 30-35.

- Peak-to-average ratio of no more than 13 dB across any 1 MHz band.

The rule harmonization proposed by the Commission for the U-NII-3 band is a reasonable compromise between allowing flexible unlicensed use across the entire U-NII-3 band while also ensuring consistent protection for incumbent co-channel and adjacent users.

**B. The Commission Should Harmonize Treatment of U-NII-1 Devices with the U-NII-3 Band.**

The U-NII-1 band was one of the first 5 GHz segments made available for unlicensed devices. However its full development has been stifled by strict power limits and unnecessary restrictions on outdoor operations. As proposed in the Notice, the Commission should revise the U-NII-1 rules to allow increased flexibility of use of the band and promote its full integration with the other U-NII bands. MSI therefore supports the Commission's proposal to harmonize the U-NII-1 rules with the U-NII-3 rules (as modified in this proceeding). Specifically, the Commission should increase the U-NII-1 power limit to 1 watt, increase the PSD limit to 17 dBm/MHz, and limit out-of-band emissions to an EIRP of -27 dBm/MHz.<sup>7</sup>

The Commission should also eliminate the restriction against outdoor operation of U-NII-1 devices. As a practical matter, there is no effective way to delineate between "indoor" and "outdoor" devices, making such an operational distinction ineffective, and creating artificial limits on the potential applications and services that could take advantage of the 5 GHz band. A manufacturer has no control over whether a device intended for indoor use is moved outdoors by a consumer. Moreover, with the emergence of portable devices setting up local ad hoc networks for peer-to-peer data exchange, there may be numerous lower power uses of U-NII devices that would present little to no interference concerns notwithstanding occurring outdoors.

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<sup>7</sup> *Id.* ¶ 40.

Harmonizing the U-NII-1 rules with those applicable to the U-NII-3 band will provide maximum flexibility to manufacturers, which will be able to develop U-NII-1 devices that can collaborate effectively with either the U-NII-2 or U-NII-3 bands. Moreover, as recognized by the Commission, the new 802.11ac standard provides for devices that can aggregate noncontiguous spectrum to operate on channels with up to 160 megahertz bandwidth.<sup>8</sup> As such, the added flexibility to be gained by harmonizing the U-NII-1 rules with the U-NII-3 band requirements could result in a significant increase in utility of the band segment.

**C. The Commission’s Proposed Service Rule Changes Are Sufficient to Protect Against Unauthorized Use of U-NII Devices.**

MSI supports the Commission’s efforts to prevent unauthorized use of wireless devices outside of the scope of their certifications. Given the history of some devices being susceptible to unauthorized modification, MSI agrees that manufacturers should take steps to ensure that their equipment cannot be programmed to operate in ways exceeding their certifications. However there is no need for the Commission to mandate specific security mechanisms or complex interference mitigation techniques beyond those already called for in the current and proposed rules.

MSI, like most manufacturers, already includes in its 5 GHz band devices features that prevent operators and users from programming them in ways that conflict with their granted equipment authorizations, such as disabling dynamic frequency selection (“DFS”) on U-NII-2 devices. In addition, the Commission notes that one of its main sources of concern with respect to unauthorized use of 5 GHz band devices was the ability for users of digitally modulated devices certified under Section 15.247 to modify their devices to operate in other frequency

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<sup>8</sup> *Id.* ¶ 19.

bands, such as U-NII-2C, where they could interfere with important incumbent uses.<sup>9</sup> However, the rule changes and harmonization proposed for the U-NII-3 band could go a long way toward addressing this problem.

For manufacturers like MSI that comply with the existing rules, the imposition of additional security features into the rules, such as disabling a device from operation in certain bands if it is improperly programmed, would therefore be redundant, unnecessary and costly. The desire to add new, complex features with only marginal potential to mitigate interference must be tempered by the costs they would add to consumer devices. Moreover, there is no evidence that DFS, where used correctly, has been ineffective at protecting incumbent users from harmful interference. Therefore, mandating the use of additional interference avoidance techniques, such as geo-location technologies combined with database registration, or enhanced sensing requirements to detect radar operation in adjacent channels, could unnecessarily harm the U-NII market by limiting the types of services and applications that could take advantage of the 5 GHz spectrum without substantively improving interference mitigation for incumbent licensees.

If the Commission does determine that additional technical capabilities are needed to assist with interference mitigation, MSI strongly encourages the Commission to provide manufacturers with a range of options that could be applied to different devices depending upon the specifics of the product or service. The U-NII band will be home to a great variety of devices and applications and mandating a “one size fits all” approach to interference mitigation could negatively impact some classes of product – especially lower-cost devices designed for the consumer market. Providing flexibility in choosing which mitigation technology to incorporate

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<sup>9</sup> *Id.* ¶ 49.

(e.g. geo-location technology vs. enhanced sensing, etc.) will allow manufacturers to determine the option that best suits the needs of its customers, while also distinguishing themselves in the market.

Regardless of the approach chosen, however, the Commission should not adopt new unwanted emissions limits based on whether the devices are operating indoors or outdoors. As discussed above, there is no effective and consistent way to define “indoors” and “outdoors” operations, due to the complexity and variety of uses cases. As a result, if the Commission were to adopt different requirements on this basis, only the strictest emissions limits would be meaningful, negatively and unnecessarily impacting devices operations across the entire market.

**D. The Commission Should Adopt Sensible, Moderate Changes to the U-NII-2A and U-NII-2C Rules.**

The U-NII-2A (5.250-5.350 GHz) and U-NII-2C (5.470-5.725 GHz) bands are extremely important components of the Commission’s 5 GHz unlicensed inventory that share spectrum with incumbent Federal radar systems. As a means of limiting the potential for harmful co-channel interference to radar systems, the Commission requires that U-NII-2 devices use DFS to avoid co-channel operation with these systems. Because, “DFS is an essential element allowing U-NII devices to share the U-NII-2A and U-NII-2C bands successfully with vital government and military radar systems,”<sup>10</sup> MSI supports the proposal that DFS be prevented from being disabled in devices certified to operate in the U-NII-2A and U-NII-2C bands.<sup>11</sup> Moreover, the Commission is correct to note that, increasingly, unlicensed devices are capable of communicating directly with each other, without the use of a central control point. Accordingly, MSI agrees with the Commission’s proposal that any U-NII devices subject to the DFS

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<sup>10</sup> *Id.* ¶ 67.

<sup>11</sup> *Id.* ¶ 68.

requirement that is capable of initiating a network should have radar detection functionality and be approved with that capability.<sup>12</sup>

MSI also agrees with the Commission's proposals to streamline and modernize the measurement and testing procedures for U-NII-2 devices. The Commission is correct in its observation that the "Uniform Channel Spreading" requirement on DFS is outdated and does not reflect the current state and trajectory of wireless technology.<sup>13</sup> In particular, the utilization of wider bandwidths in unlicensed devices—a trend that will increase with implementation of 802.11ac—makes the channel spreading requirement unnecessary. MSI also agrees that the Commission should explore alternatives to streaming video as a mechanism for testing channel loading as not all U-NII devices are designed for video transmission, and that a more general test procedure for measuring channel loading would be more appropriate.<sup>14</sup>

### **III. THE COMMISSION SHOULD OPEN NEW SPECTRUM FOR UNLICENSED OPERATION IN THE 5 GHz BAND WHILE PROVIDING ADEQUATE PROTECTION FOR INCUMBENT SERVICES.**

MSI supports the Commission's proposals to open new 5 GHz band spectrum to unlicensed use; however, in doing so the Commission must also take care to provide adequate interference protection to incumbent services operating in these bands. There is a well-documented need for additional wireless broadband spectrum, and unlicensed spectrum in particular is a key driver of innovation and economic development. Adding additional unlicensed spectrum to the 5 GHz band would be particularly beneficial as creating a contiguous unlicensed band across the 5 GHz range would create the opportunity for wider bandwidth

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<sup>12</sup> *Id.* ¶ 69.

<sup>13</sup> *Id.* ¶ 74.

<sup>14</sup> *Id.*

applications to support innovative products and services, such as those supported by the new IEEE 802.11ac specification.

Assuming it can adequately mitigate the potential for harmful interference to incumbent users, the Commission should move forward promptly with its proposals to add nearly 200 megahertz of additional spectrum for unlicensed services in the 5 GHz band.<sup>15</sup> Specifically, the Commission should create a U-NII-2B band at 5.350-5.470 GHz and a U-NII-4 band at 5.850-5.925 GHz. As the Commission suggests, the service rules for these bands should, to the extent possible, be aligned with those applicable to adjacent U-NII bands. Adopting harmonized rules in this way will create the greatest efficiencies of use and also facilitate the prompt addition of these operating bands to already certified and deployed U-NII equipment.

However, the Commission must ensure that the incumbent uses of these bands are adequately protected. As the Commission notes, the U-NII-2B band is used for a variety of Federal and Non-Federal systems including radar and unmanned aircraft systems.<sup>16</sup> As instructed by the Spectrum Act, the Commission should work closely with NTIA to analyze the risks to incumbent users to ensure that the risks are mitigated in any new rules for unlicensed use of this spectrum.<sup>17</sup> In particular, the U-NII-2B band should be subject to a DFS obligation to protect incumbent radar operations, and the sensing criteria should match those applicable to the other U-NII-2 bands. The U-NII-4 band is also home to important incumbent uses. The non-Federal mobile allocation in this band is dedicated to Dedicated Short Range Communications

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<sup>15</sup> *Id.* ¶¶ 75-101.

<sup>16</sup> *Id.* ¶¶ 83-87.

<sup>17</sup> Spectrum Act § 6406(a)(2).

Service (“DSRC”) systems operating in the Intelligent Transportation System radio service.<sup>18</sup>

Because of the potential public safety value of the deployment of vehicle-to-vehicle and vehicle-to-infrastructure communication using the DSRC/ITS radio service, the Commission’s rules need to ensure that the DSRC communications are protected from interference from U-NII unlicensed uses. To the extent that the additional research and inter-agency coordination necessary to ensure adequate protection to incumbent users will take time, the Commission should not delay action on the other important rule harmonization and modernization contemplated in the Notice.

#### **IV. THE COMMISSION SHOULD NOT ADOPT THE NEW SPECTRUM SHARING TECHNOLOGIES DISCUSSED IN THE NTIA 5 GHZ REPORT.**

The National Telecommunications and Information Administration's 5 GHz Report was an important examination of spectrum sharing in the 5 GHz band that explored multiple approaches to mitigation of interference.<sup>19</sup> Although MSI strongly supports such inquiries, as stated above it believes that the new harmonized technical rules combined with the fortified DFS requirement proposed in the Notice will be the most effective and efficient means of minimizing harmful interference in the existing U-NII bands while also allowing manufacturers sufficient flexibility to design innovative and affordable U-NII equipment. As such, a mandate of any of the enhanced spectrum sharing techniques for use in the existing U-NII bands contemplated in the NTIA report would be premature at this time.

As discussed above, new mitigation technologies, such as enhanced spectrum sensing, would add cost and complexity to 5 GHz U-NII devices. In addition to possibly requiring

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<sup>18</sup> Notice ¶ 92.

<sup>19</sup> See Department of Commerce, “Evaluation of the 5350-5470 MHz and 5850-5925 MHz Bands Pursuant to Section 6406(b) of the Middle Class Tax Relief and Job Creation Act of 2012,” available at [http://www.ntia.doc.gov/files/ntia/publications/ntia\\_5\\_ghz\\_report\\_01-25-2013.pdf](http://www.ntia.doc.gov/files/ntia/publications/ntia_5_ghz_report_01-25-2013.pdf).

compromises in device size and power consumption, complying with the new requirements would raise the consumer price on these devices at a time when the market is experiencing significant pro-consumer downward pressure due to increased competition and commoditization of the unlicensed device market. Moreover, some of the technologies proposed by NTIA are largely unproven, or have been ineffective when implemented in other markets. An enabling beacon in the 5 GHz band, for example, could be an inefficient use of spectrum and will suffer from negative propagation characteristics (*e.g.*, high effective path losses, fading, shadowing, etc.). At a minimum, the Commission should observe the effect of the new rules to be adopted in this proceeding before determining whether additional mitigation requirements are necessary.

While the new interference mitigation techniques proposed in the NTIA report would add unneeded cost and complexity for devices operating in the existing U-NII bands, as additional research and inter-agency coordination is done to evaluate the feasibility of opening up the 5.850-5.925 GHz band for possible unlicensed uses on a secondary basis to the incumbent DCRC/ITS radio service, the need for more advanced spectrum sharing techniques may emerge. If this is indeed the case, some of the more advanced interference mitigation techniques that the NTIA has examined may become viable, cost-effective options for ensuring the protection of the incumbent licensees in that band.

**V. THE COMMISSION SHOULD ALLOW SUFFICIENT FLEXIBILITY TO ENABLE AN ORDERLY TRANSITION TO THE NEW U-NII RULES.**

The rule changes being proposed by the Commission could have a significant positive impact on the unlicensed broadband device market. However, these benefits will only be realized if the Commission's transition policies are flexible enough to accommodate the demands of the wide variety of 5 GHz U-NII equipment currently deployed. For example, transition policies and periods that may be appropriate for U-NII equipment embedded in consumer

devices, which may be relatively inexpensive and have quick turnover periods, may be unworkable for more complex and expensive industrial or enterprise deployments. As such, the Commission should lengthen its proposed transition period for U-NII devices, and it should ensure sufficient flexibility to modify existing device certifications to incorporate the new bands and operating rules.

The Commission’s proposed transition policies, which would require implementation of the rules for new equipment within twelve months and then would effectively require end-of-life (“EOL”) for all equipment certified under the prior rules within two years, do not allow sufficient flexibility for existing development and manufacturing processes. Given the lengthy device development process, and the fact that the substantial revisions to the U-NII rules contemplated in this proceeding could require changes to fundamental device components, twelve months may not be a sufficient time for manufacturers to incorporate rule changes into all new devices. Moreover, only one additional year after the effective date of the rules is an insufficient time to EOL all equipment certified prior to the 12 month transition period. MSI supports the Commission’s proposal to grandfather U-NII devices that are already installed or in use, because “[r]equiring immediate upgrade or replacement of existing U-NII devices would be a financial burden.”<sup>20</sup> Requiring unduly short transition period for manufacturers would be similarly burdensome and could lower the overall quality of new U-NII devices—potentially negatively impacting their adoption by consumers. Therefore, the Commission should instead adopt a final transition period of five years, with at least two years for manufacturers to begin producing U-NII devices that comply with the new rules.

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<sup>20</sup> Notice ¶ 115.

The Commission also should take other steps to promote the prompt adoption of these new bands by industry and the public. Many existing devices are already capable of operating in the new bands, or pursuant to the revised rules, after necessary firmware and software updates—even if they were not originally certified for operation on the U-NII bands. For example, a certification grant may be for 2.4 GHz and 5.8 GHz 802.11 WLAN, but the data submitted with the original grant could be sufficient to demonstrate compliant operations on the U-NII-4 or U-NII-2 bands under the new rules. The Commission should facilitate these upgrades by allowing the addition of new operating bands to existing equipment certifications through category 2 permissive changes.

After the bands are added to the certification, an equipment manufacturer could make the new service bands available through a software/firmware upgrade. In this scenario it would be incumbent on manufacturers, through firmware maintenance, to ensure that users do not modify their equipment to operate on uncertified bands or at power levels greater than those certified. By allowing the addition of these bands to existing equipment through permissive changes, the Commission can more effectively leverage the large embedded U-NII device infrastructure to bring the new spectrum to bear in serving the public interest.

## **VI. CONCLUSION**

MSI broadly supports the many proposals in the notice that would promote expanded unlicensed use of the 5 GHz band. Specifically, the Commission should move forward with its proposals to harmonize regulatory treatment of unlicensed devices in the U-NII-3 and U-NII-1 bands, including by eliminating the unworkable distinction between "indoor" and "outdoor" operation in the U-NII-1 band. Additionally the Commission should not adopt unnecessary new interference mitigation requirements for the U-NII-2 band, but instead should act on its proposal to strengthen the applicability of the DFS requirement. Finally, the Commission should proceed

with making new unlicensed spectrum available in the 5 GHz band and should facilitate the prompt integration of these new technologies into existing devices.

Respectfully submitted,

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