

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554**

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

REPLY COMMENTS OF BROADCOM LTD.

Broadcom Ltd. (“Broadcom”) submits these reply comments in response to the comments of the Alliance of Automobile Manufacturers, Association of Global Automakers, Intelligent Transportation Society of America, and DENSO International America, Inc. (collectively, the “Automakers”) filed in the above-referenced proceeding on July 7, 2016. The Automakers would sacrifice a meaningful opportunity for unlicensed operations to share the 5.850-5.925 GHz (“U-NII-4”) band with the Dedicated Short Range Communications (“DSRC”) service by adhering to an outdated band plan. By adopting the superior rechannelization approach, the Commission can better protect delay-sensitive DSRC traffic and provide dependable access to the band for unlicensed operations.

I. THE AUTOMAKERS SEEK TO PRESERVE AN OUTDATED PLAN

The Automakers outline the rationale behind the current band plan for the U-NII-4 spectrum and argue that the Commission should not revisit that rationale now by changing the band plan.^{1/} However, they fail to consider the implications of a band plan that was developed prior to 2004. Just because those rules may have been appropriate at the time they were developed is no reason to adhere to them today when the public interest dictates otherwise.

^{1/} See Comments of the Alliance of Automobile Manufacturers, Association of Global Automakers, Intelligent Transportation Society of America, and DENSO International America, Inc., ET Docket No. 13-49, at 10-25 (filed July 7, 2016) (“Automakers Comments”).

As Broadcom demonstrated in its comments, one significant factor that makes the current band plan outdated is the existence of hundreds of millions of devices operating in the 5.725-5.850 GHz (“U-NII-3”) band, immediately adjacent to the U-NII-4 band.^{2/} When the U-NII-4 band plan was initially adopted, the Commission could not have foreseen the explosive growth of Wi-Fi and other unlicensed applications in general, and the use of the U-NII-3 band in particular. This change alone, as others note, requires a reevaluation of the U-NII-4 band plan to ensure that there is maximum spectral separation between timing-sensitive DSRC operations and U-NII-3 band use.^{3/} The Automakers themselves have consistently expressed concern about the impact of U-NII-3 operations on DSRC channel 172.^{4/} Moving Basic Safety Messaging (“BSM”) traffic from channel 172 to channel 180 and otherwise updating the band plan is the most effective way to promote the public interest and protect delay-sensitive DSRC applications.

Modification of technical rules is a regular FCC practice, prompted by changes in technology and the spectrum ecosystem, in order to best serve the public interest. By way of example, the Commission modified the band plan for what is now the Broadband Radio Service and Educational Broadband Service in an attempt to allow licensees of those service to more effectively provide mobile broadband service and preserve the ability to offer other services.^{5/}

^{2/} See Comments of Broadcom Ltd., ET Docket No. 13-49, at 6 (filed July 7, 2016) (“Broadcom Comments”). See also Comments of the National Cable & Telecommunications Association on the Request to Update the U-NII-4 Band Record, ET Docket No. 13-49, at 19 (filed July 7, 2016) (noting that the 5.9 GHz U-NII-4 band “is adjacent to the workhorse U-NII-3 band, where the Commission’s existing service rules have already resulted in substantial Wi-Fi deployments”).

^{3/} See Comments of Qualcomm Incorporated on Public Notice Seeking to Refresh the Record, ET Docket No. 13-49, at 3-4, 12 (filed July 7, 2016); Comments of the Computing Technology Industry Association (CompTIA), ET Docket No. 13-49, at 2 (filed July 7, 2016).

^{4/} See, e.g., Association of Global Automakers, Inc. and Alliance of Automobile Manufacturers, Petition for Reconsideration, ET Docket No. 13-49 (filed May 6, 2016).

^{5/} See generally *Amendment of Parts 1, 21, 73, 74 and 101 of the Commission’s Rules to Facilitate the Provision of Fixed and Mobile Broadband Access, Educational and Other Advanced Services in the*

The Commission also revised its band plan for the private land mobile radio services to reflect equipment migration to narrower bandwidths.^{6/} In each of those instances, and many others,^{7/} the public interest prompted the Commission to mandate change even though this outcome required the affected industries to modify their business plans. The same rationale applies here. It is contrary to the public interest to preserve the existing band plan simply because it is the existing band plan.

In addition to ignoring the public interest benefits that could be achieved by rechannelizing the band to move timing-sensitive operations, the Automakers provide no support for their counter-argument — that rechannelization would delay, or even impair, the rollout of DSRC systems. To the contrary, the Automakers ignore the fact that DSRC channel 180 — one of the channels where Broadcom recommends delay-sensitive traffic be moved — is already designated for sensitive vehicle-to-vehicle (“V2V”) communications and channel 184 is already designated as an alternate BSM channel.^{8/} Moreover, they overlook the fact that under the rechannelization approach, timing-sensitive applications will continue to be able to use 10 megahertz channels at the top end of the U-NII-4 band. These timing-sensitive applications will not require reengineering and can presumably be introduced within the time frame the Automakers originally anticipated, with limited additional testing. Those applications that can

2150-2162 and 2500-2690 MHz Bands, et al., Report and Order and Further Notice of Proposed Rulemaking, 19 FCC Rcd. 14165 (2004).

^{6/} See *Replacement of Part 90 by Part 88 to Revise the Private Land Mobile Radio Services and Modify the Policies Governing Them and Examination of Exclusivity and Frequency Assignment Policies of the Private Land Mobile Radio Services*, Report and Order and Further Notice of Proposed Rulemaking, 10 FCC Rcd. 10076 (1995).

^{7/} See, e.g., *Rechannelization of the 17.7-19.7 GHz Frequency Band for Fixed Microwave Services under Part 101 of the Commission’s Rules*, Report and Order, 21 FCC Rcd. 10900 (2006); *Review of Technical and Operational Requirements: Part 74-E Aural Broadcast STL and ICR Stations, and Part 74-F TV Auxiliary Broadcast Stations*, Report and Order, 102 FCC 2d. 940 (1985).

^{8/} See Automakers Comments at 9.

tolerate more delay, such as some vehicle-to-infrastructure (“V2I”) and vehicle-to-person (“V2P”) uses, would operate in the lower segment of the U-NII-4 band and share successfully with other unlicensed uses. These V2I and V2P applications have not been deployed, and based on the record do not appear to have even been tested, meaning that rechannelization will only minimally impact their introduction.

II. RECHANNELIZATION WILL BEST PROTECT DSRC AND ACCOMMODATE WI-FI

The Automakers wrongly characterize the current phase of this proceeding as an election between safety interests and “non-safety-related” commercial business plans.^{9/} This is a false choice. While DSRC supports important safety-related services, the Automakers’ comments make it clear that other services — such as traffic information — will also be provided through DSRC.^{10/} Therefore, not all DSRC applications must be provided using the channels that Broadcom and others propose be exclusively dedicated to DSRC. Only those delay-sensitive applications need be provided on the channels further from U-NII-3 devices. Other applications can successfully share with unlicensed operations in the remainder of the U-NII-4 band.

As part of responsibly reexamining the DSRC rules, the Commission should also determine the DSRC applications that are the most delay-sensitive. As noted above, the applications that the Commission identifies can continue to use the exclusive 10 megahertz-wide channels at the top of the U-NII-4 band, while those applications that can tolerate higher occupancy in the band can share with unlicensed devices in the 20 megahertz-wide channels. Even within the lower segment of the U-NII-4 band, designated applications could be prioritized

^{9/} See *id.* at iv, 26-27 (asserting that the work involved to deploy DSRC applications “should not be trivialized to suit the short-term interests of providers of non-safety-related services”).

^{10/} See, e.g., *id.* at 21-22, 53 (pointing to the use of DSRC for electronic toll collection and Japan’s use of the 5 GHz spectrum for road traffic information and route guidance).

as necessary through modified Enhanced Distributed Channel Access (“EDCA”) technologies if the Commission deems it necessary. The Automakers themselves recognize the common 802.11 pedigree for DSRC and Wi-Fi^{11/} while curiously simultaneously complaining about “[f]orcing applications previously planned for DSRC onto Wi-Fi protocols”^{12/} that use “readily available, generic Wi-Fi chipsets.”^{13/}

In contrast to the rechannelization approach — which seeks to protect DSRC delay-sensitive safety of life applications while promoting the public interest in making more unlicensed spectrum available — the “detect and avoid” plan does not even appear to serve DSRC interests. It freezes in place a band plan which, as demonstrated above, could jeopardize delay-sensitive traffic on channel 172 based on U-NII-3 out-of-band emissions.

While Automakers claim that the detect and avoid plan can permit use of the U-NII-4 band when DSRC capacity is not needed, the prevalence of automobiles in urban and suburban areas in conjunction with the requirement to vacate the band in the presence of even a single DSRC transmission will almost certainly ensure that the band will never be available for unlicensed communications in the areas where additional bandwidth is most needed. There will be no sharing in fact. In contrast, rechannelization will support real sharing by more realistically assessing timing-critical DSRC applications and segmenting different types of DSRC traffic.

The Automakers’ focus on using the U-NII-4 band for DSRC with no meaningful and dependable sharing is further demonstrated by their report on testing of the detect and avoid approach. They note the limited impact on DSRC, but tellingly do not report on the ability of

^{11/} See *id.* at 32-34.

^{12/} *Id.* at 27.

^{13/} *Id.* at 38.

unlicensed devices to make any use of the band.^{14/} Nor would allowing only indoor use of Wi-Fi in the U-NII-4 band — as the Automakers have suggested — result in any meaningful sharing of the spectrum.^{15/} Using a detect and avoid approach would constrain even indoor Wi-Fi use in the U-NII-4 band, especially on the lower levels of a building anywhere near a road or parking lot, limiting operations to deep inside or on upper levels of buildings. Wi-Fi and many other broadband technologies, are intended to facilitate anytime, anywhere connections. Limiting use of U-NII-4 for unlicensed operations to circumstances where it will not be preempted by DSRC will hobble its utility. Such a reduced level of use does not constitute meaningful sharing and would likely stymie the development of applications that would use the wider channels that the rechannelization approach would provide.

The Automakers assert that the detect and avoid approach is most consistent with congressional intent.^{16/} However, they both overstate the point and fail to recognize Congress' interest in making spectrum available for unlicensed operations. While Congress has certainly signaled its support of DSRC, it has not expressed any opinion on how the service should be offered. So, a rechannelization approach that protects DSRC timing-sensitive applications is no less consistent with congressional intent than a detect and avoid approach. More importantly, a rechannelization plan *would* be consistent with Congress' ongoing efforts to ensure that there is sufficient spectrum available for unlicensed operations, including in the 5 GHz band in particular. The 2012 Middle Class Tax Relief and Job Creation Act specifically required the evaluation of the potential use of the U-NII-4 band for unlicensed operations.^{17/} And multiple

^{14/} *Id.* at 42-43.

^{15/} *See id.* at 44.

^{16/} *See id.* at 46-49.

^{17/} *See* 47 U.S.C. § 1453; Middle Class Tax Relief and Job Creation Act of 2012 § 6406, Pub. L. No. 112-96.

bills introduced in the current session of Congress, among other things, seek to ensure additional spectrum is allocated for unlicensed operations, direct the FCC and NTIA to establish an unlicensed spectrum policy, and otherwise underscore the importance of unlicensed spectrum for meeting the critical needs of underserved populations.^{18/} A rechannelization approach — which provides a better opportunity for unlicensed use of the U-NII-4 band — we believe more closely adheres to Congressional intent than a plan primarily focused on DSRC.

III. AUTOMAKERS MISSTATE INTERNATIONAL CONSIDERATIONS

Finally, the Automakers suggest that the detect and avoid approach would better foster international harmonization.^{19/} A rechannelization approach that designates timing-sensitive applications to the upper segment of the U-NII-4 band will not impede international harmonization of the U-NII-4 band for DSRC. As the Automakers note, the E.U. has not reserved channels 172 or 174 for safety use.^{20/} Accordingly, making those channels available for shared DSRC/unlicensed operations will not be inconsistent with European operations. Similarly, there is no safety use of the U-NII-4 band in Japan. Safety applications are performed using U-NII-3 band channels.^{21/} Accordingly, rechannelization – which would still support DSRC operations in the 5 GHz band – will not impede international harmonization.

Moreover, as the Commission recently made clear in its Spectrum Frontiers proceeding, while international harmonization is important, the United States must implement the spectrum

^{18/} See, e.g., Spectrum Pipeline Act of 2015 § 1004, Pub. L. No. 114-74; MOBILE NOW Act, S.2555, 114th Cong. §§ 3-5, 12, 16, 18-19 (2016).

^{19/} Automakers Comments at 50-54.

^{20/} See *id.* at 52 (citing Christoph Sommer & Falko Dressler, *Vehicular Networking* 122 (2014)).

^{21/} See Automakers Comments at 53 (citing Michigan Department of Transportation and Center for Automotive Research, *Global Harmonization of Connected Vehicle Communication Standards*, at 8 (Jan. 12, 2016), <http://bit.ly/29j14O9>).

policy best for its National interest that is consistent with its international obligations.^{22/} In this case, the need for additional capacity for unlicensed applications in general and, in particular, the 5 GHz band, is clear. The Commission can make meaningful progress towards that goal while protecting DSRC by adopting Broadcom's rechannelization plan.

IV. CONCLUSION

The public interest requires the Commission to reexamine the channelization plan for the U-NII-4 band, rather than continuing to use an outdated band plan. By adopting the rechannelization approach to the U-NII-4 band, the Commission can protect delay-sensitive DSRC more effectively than under the current band plan and provide dependable access to the spectrum for unlicensed operations.

Respectfully submitted,

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^{22/} See *Use of Spectrum Bands Above 24 GHz for Mobile Radio Services, et al.*, Report and Order and Further Notice of Proposed Rulemaking, GN Docket No. 14-177, *et al.*, FCC 16-89, ¶¶ 16, 27 (2016) (“The significant domestic and international interest in making the 28 GHz band available for new mobile uses clearly supports taking action in this *Report and Order* to create new flexible use licenses.”).