

February 1, 2019

VIA ELECTRONIC FILING

Marlene H. Dortch, Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20554

**COMMENTS OF ENCINA COMMUNICATIONS CORPORATION
RE NOTICE OF PROPOSED RULE MAKING
ET DOCKET 18-295 UNLICENSED USE OF THE 6 GHz BAND AND
EXPANDING FLEXIBLE USE IN MID-BAND SPECTRUM BETWEEN 3.7 and 24 GHz
GN DOCKET NUMBER 17-183**

Dear Ms. Dortch:

Encina Communications Corporation (ECC) agrees with the NPRM's goal of ensuring that licensed services operating in the U-NII-5 (5.925 – 6.425 GHz) and U-NII-7 (6.525 – 6.875 GHz) bands continue to thrive while promoting new opportunities for unlicensed use in these bands -- which may also complement new licensed 5G services by allowing providers to offer a full range of services to consumers -- and helping to secure U.S. leadership in the next generation of wireless services.

Although restricting the operation of unlicensed devices to outside of exclusion zones solves the interference problem, it also unintentionally severely restricts the locations of deployment of unlicensed devices. However, the method of converting exclusion zones into flexible-use "Inclusion Zones" both satisfies the non-interference requirement, as well as dramatically increases the area where unlicensed devices can operate.

I. DISCUSSION

In paragraph 23 of the NPRM we were pleased to see that the Commission seeks comments and alternative methods to ensure protection of incumbent services on three proposals.

1. *"The proposed framework for U-NII-5 and U-NII-7 prohibits unlicensed devices from operating co-channel with any fixed link within that link's defined exclusion zone."*
2. *"Similar to the licensing of new fixed links, which require frequency coordination to protect existing links,¹ we propose to implement a frequency coordination process for unlicensed devices in these bands to ensure that these new unlicensed devices do not cause harmful interference to fixed service incumbents."*
3. *"Prior to operating in these bands, a standard-power access point² would determine or receive a list of permissible operating frequencies and restrict operation to those*

¹ 47 CFR § 101.103.

² 47 CFR § 15.403(a).

frequencies. Similarly, client devices³ would have to obtain a list of permissible operating frequencies from a standard-power access point and restrict operation to those frequencies.”

In Section II we comment on the above items regarding operation outside of exclusion zones, and the significant benefits of also safely operating unlicensed devices inside exclusion zones of licensed stations – converting them into “inclusion zones”. This alternative and complementary method is discussed in Section III, and the benefits in Section IV.

II. COMMENTS

The Commission's goal of expanding Flexible Use in mid-band spectrum is commendable. However, by trying to ensure that licensed services continue to thrive by prohibiting unlicensed devices from operating co-channel with any fixed link within that link's defined exclusion zone, the use of unlicensed devices would be relegated to very small areas of operation, serving a very small percentage of the population, as shown below.

1. Exclusion Zones

In paragraph 23 of the NPRM the Commission proposes to prohibit unlicensed devices from operating co-channel with any fixed link within that link's defined exclusion zone. To consider the impact of prohibiting unlicensed operation within exclusion zones it is necessary to define exclusion zone areas of commonly used antennas and receivers in the U-NII-5 and U-NII-7 bands using TIA/EIA Telecommunications Systems Bulletin Interference Criteria for Microwave Systems TSB10-F.

Definitions and Equations:

1. Receiver sensitivity: The receive signal level that results in a BER of 10^{-6} .
2. Harmful interference: An interference level that reduces receiver sensitivity by 1dB or more.
3. Exclusion Zone: The area around a licensed receiver's antenna within which a transmitting device will cause harmful interference.
4. LRS: A Licensed Station around which the licensee allows unlicensed devices to operate within a certain radius from the licensed station provided the signal strength arriving at any licensed station from any unlicensed device will be less than the signal from the LRS or less than -101 dBm. An LRS can be a public or private network, or both.
5. Path Loss: $PL = 96.6 + 20\log_{10} F + 20\log_{10} D$
where PL is the LOS path attenuation in dB, F is frequency in GHz, and D is distance in miles.

³ A U-NII device whose transmissions are under the control of an access point and which is not capable of initiating a network. See 47 CFR § 15.403(g) of the proposed rules.

6. Interference: $EIRP + Ant\ Gain - Ant\ Atten - PL$
 where EIRP is the radiated power of a transmitting device in the direction of a victim receiver, Ant Gain is the gain of the victim's antenna, Ant Atten is the victim's antenna loss in the direction of the interfering transmitter, and PL is the LOS attenuation in dB from the interfering transmitting device to the victim.
7. Receiver Bandwidth: 30 MHz
8. Receiver Interference Threshold: -101 dBm

Figure 1. shows a computer plot of the Exclusion Zone around a licensed station (victim receiver with an interference threshold of -101 dBm), a PAR6-59 antenna, and an Access Point (AP) interferer with an EIRP of 36 dBm. Although the keyhole coordination distance in TSB10-F is given as 400 km (250 miles), note that the Figure 1 plot only goes out to 200 km (125 miles).

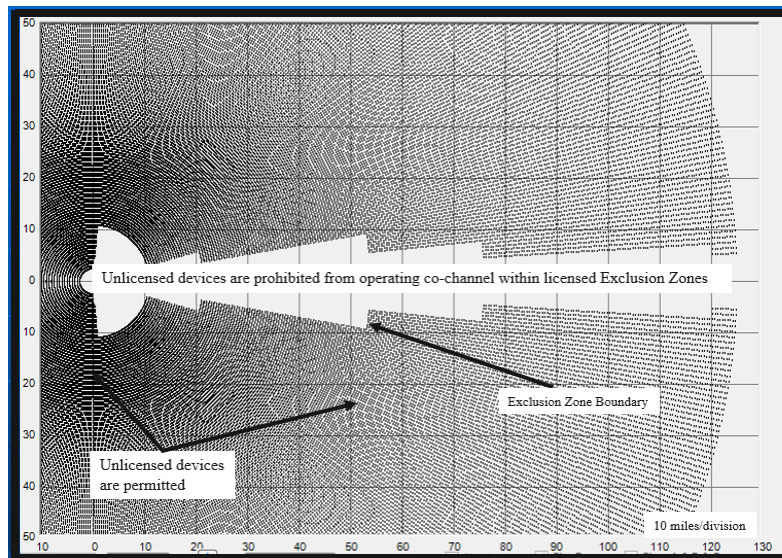


Figure 1

With the above approach, the exclusion zones of commonly used antennas (VHLPX3-6W, PARX6-59, UHX10-59) for a receiver with an interference threshold of -101 dBm (typical for licensed receivers) when subject to interference from an AP with an EIRP of 36 dBm (the maximum allowed under Part 15 of the rules but typical for AP deployments), resulted in the following exclusion zone areas:

VHLPX3-6W = 3,427 sq. miles

PAR6-59 = 1,520 sq. miles

UHX10-59 = 1,282 sq. miles

In Appendix A of the NPRM the number of Common Carrier and Operational Fixed Service call signs in the U-NII-5 and U-NII-7 bands is given as 46,255. Therefore, the combined exclusion zone area is at least 59 million square miles.

Because the US developed land area is only 217,000 square miles⁴, this means that even if we considered that all existing stations were only licensed to use one of the available channels within the band (though we know that in many cases multiple channels are licensed, and in some cases all channels) and that many of the APs had terrain blockage, unlicensed devices will be prohibited from operating in most, or a significant portion of, markets nationwide.

In paragraph 23 of the NPRM the Commission asks:

“Are there any alternative methods to ensure protection of incumbent services? What are the costs and benefits of any proposed alternative?”

Fortunately there is, which is to convert exclusion zones into inclusion zones, thereby dramatically increasing the percentage of the total market available for unlicensed use, with a simple, proven and safe way of protecting existing licensees. This alternative and complementary method is discussed in Section III, and the benefits in Section IV.

2. Inclusion Zones

2.1 Operating Unlicensed Devices Within the Prior Coordinated Exclusion Zones of Licensed Stations

Regarding the dilemma of protecting licensees from harmful interference by prohibiting unlicensed devices from operating co-channel in exclusion zones -- which would restrict the operation of unlicensed devices to a very small market percentage -- the solution is for licensees to safely operate unlicensed devices within their Licensed Reference Station's exclusion zone(s), converting exclusion zones into inclusion zones by ensuring that the interference arriving at any other licensed station from any unlicensed device is always less than the interference level from the LRS, or less than -101 dBm. (See Appendix A.)

Not only would this allow new licensees to provide a plethora of new services, but it would give existing licensees the opportunity to upgrade their licensed stations and convert their exclusion zones into inclusion zones that support licensed and unlicensed devices and applications such as PtMP backhaul and access, 4G/LTE/LAA/LWA small cell networks, 5G small cell networks, Wi-Fi 6 APs, Hot Spots, nomadic and mobile clients, and IoTs.

All of this can be achieved using IEEE 802-11, 3GPP protocols and Part 15 and 101 rules, with only minor rule changes and simple software modifications. And, for unlicensed devices that operate within inclusion zones, no complicated and untested AFC interference mitigating protocols and mechanisms are required. In Appendix A are the proposed minor rule changes, in addition to those proposed in this NPRM, which would minimize unnecessary licensing delays and harmonize channel bandwidths across different bands with high volume chipsets now in use in unlicensed and other licensed bands.

⁴ From EPA, USDA Economic Research Service and Western Watershed Project publications.

2.1.1 Methodology

First, a service provider's spectrum manager licenses an LRS pursuant to Rule 101.103.

The service provider would then announce that it now provides unlicensed 6 GHz Wi-Fi in a service area(s) -- the same as when a service provider upgrades from 3G to 4G LTE and advertises the new upgraded service.

Consumer-Deployed:

The consumer goes to the service provider's store (or other electronics outlet), confirms that where they plan to use the AP is within a service provider's 6 GHz service area, and purchases a 6 GHz capable AP with a hardware address, SIM-card or R-UIM.

When the consumer connects the AP to the Internet, the service provider identifies the MAC address as that of a subscriber and retrieves other data -- such as the AP's latitude, longitude and elevation -- and relays the necessary information to the operator's spectrum manager's computer, which identifies the nearest supporting LRS, confirms that the AP is within the service area and meets the non-interference criteria, and then allows the AP to transmit on the same frequency and within the channel bandwidth as the LRS. If the AP is disconnected from the Internet then reconnected at a new location, the same initiation protocol would be used.

Operator-Deployed:

If the service provider deploys micro cells, femto cells or mobile hot spots, it already knows the operating frequency(s) of the LRS and knows to deploy these devices within the (safe) service area, so they will not cause harmful interference to other existing licensees.

3. Benefits of Operating Inside and Outside Exclusion Zones

1. Dramatically increases the efficient and effective use of spectrum.
2. Unlicensed and licensed devices can safely be deployed in the U-NII-5 and U-NII-7 bands in and around every city and town nationwide, instead of only in those few locations where there are subscribers outside of exclusion zones.
3. New Fixed Service applicants are coordinated and licensed under existing rules and protocols (Rule 101.103).
4. APs and Client Devices can safely operate within buildings and outdoors without complicated AFC protocols.
5. Existing Fixed Service operators have the option of upgrading their PtP licensed stations to support Flexible-Use services.
6. Because Inclusion Zones use existing databases, standards and procedures -- requiring only minor rule changes and simple software changes -- it is possible to begin licensed and unlicensed operation in the U-NII-5 and U-NII-7 bands far sooner than the operation

of unlicensed devices outside of Exclusion Zones, thereby bringing the benefits of Flexible Use to consumers faster, and dramatically improving industry's return on investment on next generation PtMP backhaul/access, mobile hotspots, Wi-Fi 6 APs, IoTs, nomadic and mobile clients, 4G LTE/LAA/LWA small cell networks and 5G small cell mobile networks and products.

III. CONCLUSION

The benefits of operating unlicensed devices within Inclusion Zones using the methodology described are numerous and substantial, and most importantly, can be realized immediately and safely.

Respectfully submitted.

Michael Mulcay, Chairman & CTO
Encina Communications Corporation
6701 Democracy Boulevard, Suite 300
Bethesda, MD 201817

Courtesy copies to:

Ajit Pai, Chairman, ajit.pai@fcc.gov
Michael O'Rielly, Commissioner, mike.orielly@fcc.gov
Brendan Carr, Commissioner, brenden.carr@fcc.gov
Jessica Rosenworcel, Commissioner, jessica.rosenworcel@fcc.gov
Geoffrey Starks, Commissioner, geoffrey.starks@fcc.gov
Rachael Bender, Wireless Advisor to Chairman Pai, rachael.bender@fcc.gov
Umair Javed, Wireless Advisor to Commissioner Rosenworcel, umair.javed@fcc.gov
Erin McGrath, Legal Advisor to Commissioner O'Rielly, erin.mcgrath@fcc.gov
Will Adams, Wireless Advisor to Commissioner Carr, will.adams@fcc.gov
Daudeline Meme, Wireless Advisor to Commissioner Stark, daudeline.meme@fcc.gov
Julius P. Knapp, Chief OET, julius.knapp@fcc.gov
Donald Stockdale, Chief WTB, donald.stockdale@fcc.gov

APPENDIX A

Proposed Rule Changes

Rule 101.115

(a) *~~“Unless otherwise authorized upon specific request by the applicant, each s~~ Stations authorized under the rules of this part must employ a directional antenna adjusted with the center of the major lobe of radiation in the horizontal plane directed toward the receiving station with which it communicates: provided, however, where a station communicates with more than one point, a multi- or omni-directional antenna ~~may be~~ is authorized ~~if necessary~~. New Periscope antenna systems will not, under ordinary circumstances, be authorized.”*

Rule 101.143

(a) Unchanged.

(b) *For paths shorter than those specified in paragraph (a) of this section, the EIRP shall not exceed ~~the value derived from the following equation:~~ 50 dBm.*

[balance deleted]

(c) Deleted (related to equation in (b) above, no longer applicable).

(b) through (g) are unchanged.

Rule 101.147

Add 20 MHz, 40 MHz and 80 MHz channel bandwidths to the 5.925 – 6.425 GHz and 6.525 – 6.875 GHz bands.

APPENDIX B

PowerPoint Presentation