

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

In the Matter of)	
)	
Unlicensed Use of the 6 GHz Band)	ET Docket No. 18-295
)	
Expanding Flexible Use in Mid-Band Spectrum)	GN Docket No. 17-183
Between 3.7 and 24 GHz)	

COMMENTS OF APCO INTERNATIONAL

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TABLE OF CONTENTS

I.	Introduction and Summary.....	2
II.	Public Safety Spectrum Bands are Unsuitable for Unproven Spectrum Sharing Methods.....	4
III.	Standard-Power Unlicensed Operation in the U-NII-5 and U-NII-7 Bands	5
A.	Determining Permissible Frequencies of Operation	6
B.	Designating an AFC System Operator.....	8
i.	Security Requirements	8
ii.	Advantage of a Single AFC System Operator	9
iii.	AFC Operator Requirements	9
C.	Protecting Incumbents from Harmful Interference	10
i.	Utilizing the Commission’s Universal Licensing System	10
ii.	Interference Protection Criteria.....	11
iii.	Adjacent Channel Protection	12
iv.	Multipath Fading.....	12
v.	Propagation Model.....	13
vi.	Standard-Power Access Point Height and Location	13
vii.	Client Devices.....	14
IV.	Low-Power Indoor Unlicensed Devices in the U-NII-6 and U-NII-8 Bands.....	15
V.	Other Unlicensed Operation Options.....	16
A.	Low-Power Indoor Operation in the U-NII-5 and U-NII-7 Bands	16
B.	High Power Operation in the U-NII-6 and U-NII-8 Bands.....	16
C.	Mobile and Transportable Operation	17
VI.	Technical Rules	17
A.	Power Limits.....	17
B.	Prohibition on Use in Moving Vehicles and Unmanned Aircraft Systems.....	18
VII.	Additional Mitigation Measures.....	18
A.	Digital Identifying Information.....	19
B.	Band In-Use Database.....	19
C.	Interference Resolution Process	20
D.	Informational Requirements.....	20

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The Association of Public-Safety Communications Officials-International, Inc. (APCO)¹ submits the following comments in response to the Commission’s Notice of Proposed Rulemaking (NPRM) in the above-captioned proceeding.² The Commission proposes to expand unlicensed use in the 6 GHz band.³ APCO understands the interest in expanding opportunities for unlicensed spectrum, but it is critical that both current and future public safety operations in the 6 GHz band remain reliable and free from interference.⁴

APCO is concerned that the proposed unlicensed use in the 6 GHz band will cause harmful interference to public safety operations. Spectrum bands housing public safety operations are not the appropriate arena to deploy new, unproven spectrum sharing and

¹ Founded in 1935, APCO is the nation’s oldest and largest organization of public safety communications professionals. APCO is a non-profit association with over 31,000 members, primarily consisting of state and local government employees who manage and operate public safety communications systems – including 9-1-1 Emergency Communications Centers (ECCs), emergency operations centers, radio networks, and information technology – for law enforcement, fire, emergency medical, and other public safety agencies. APCO is the only organization that provides public safety agencies with full radio frequency management services, including frequency coordination, engineering, and license preparation and management.

² In the Matter of Unlicensed Use of the 6 GHz Band, Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz, ET Docket No. 18-295, GN Docket No. 17-183, *Notice of Proposed Rulemaking*, FCC 18-147 (rel. Oct. 24, 2018) (“NPRM”).

³ *Id.* at para. 19.

⁴ The Commission emphasizes its commitment to preserve and protect the important base of incumbent users in the 6 GHz band. *Id.* at para. 2.

frequency coordination methods.⁵ Should the Commission proceed, it must substantially revise its proposal and ensure effective mechanisms are in place to mitigate potential interference and rapidly resolve any interference should it occur.

I. Introduction and Summary

Public safety use of the 6 GHz band must remain reliable and free from interference. The U-NII-5 and U-NII-7 bands are heavily used and relied upon for fixed point-to-point microwave links essential to public safety services, and the U-NII-6 band is used for mobile and air-to-ground public safety operations. APCO is not opposed to the use of spectrum sharing techniques in a band where public safety operates, so long as any techniques have undergone substantial testing and are proven in advance.

APCO remains concerned that expanding unlicensed use in the 6 GHz band will cause harmful interference to public safety operations. Fixed links are not designed to detect interference until after a communications link fails, putting safety of life and property at risk. Additionally, controlling unlicensed activity and identifying causes of interference will be difficult. APCO's concerns are compounded by the vast amount of unlicensed devices that are likely to be deployed and the fluctuating nature of unlicensed activity. Thus, the Commission must ensure that any Automated Frequency Coordination (AFC) system implemented is

⁵ APCO is unaware of any current spectrum sharing techniques that have been adequately proven. Regarding the frequency coordination system proposed for use in the U-NII-5 and U-NII-7 bands, the Commission states that "As with the procedures we have adopted for other shared-use bands, such as white spaces and the Citizens Broadband Radio Service [3.5 GHz], this process would be automated." *Id.* at para. 23. However, in November, a Wireless Telecommunications Bureau and Office of Engineering and Technology report concluded that "It is too soon to know whether other bands may be suitable for licensed or unlicensed use based on the techniques used in the 3.5 GHz band." In the Matter of Report to Congress Pursuant to Section 1008 of the Spectrum Pipeline Act of 2015, as Amended by the RAY BAUM'S Act of 2018, Use of Spectrum Bands Above 24 GHz for Mobile Radio Services, 3.5 GHz SAS and ESC Applications, Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz, Promoting Investment in the 3550-3700 MHz Band, GN Docket Nos. 14-177, 15-319, 17-183, 17-258, *Report*, DA 18-1128, at para. 26 (rel. Nov. 2, 2018). Additionally, the National Association of Broadcasters has noted that the white space databases remain "dysfunctional, inaccurate and unpoliced." John Eggerton, NAB: White Spaces Database Still Not Ready for Prime Time, *Broadcasting & Cable*, (Aug. 17, 2018) available at <https://www.broadcastingcable.com/news/nab-white-spaces-database-still-not-ready-for-prime-time>.

designed to protect new and existing public safety licensees from interference. This includes: limiting standard-power access point operation to a list of permissible frequencies provided by the AFC system; requiring access points to periodically verify whether frequency availability has changed, and to cease operation if a verification cannot be obtained or a channel is no longer available; and requiring device registration in the AFC database. The Commission should also prohibit client devices from transmitting in the 6 GHz band unless a device is actively associated with an access point that has verified permissible channels with the AFC system.

Entities interested in becoming AFC system operators should be required to submit a proposal to the Commission that includes a description of how the database will be designed, including security measures, and measures that will be taken to prevent and quickly resolve reports of potential interference. Further, APCO urges the Commission to take steps that will help to protect incumbents from interference such as adopting an interference protection criteria of no worse than an interference to noise ratio of -6 dB, and protecting fixed links operating on adjacent and second-adjacent channels.

APCO opposes allowing the operation of low-power indoor access points that are not subject to a frequency coordination system in the 6 GHz band. Such unlicensed uses are likely to cause interference to public safety communications. Restricting low-power access points to indoor use would be difficult, if not impossible. Even if an indoor-only limitation could be enforced, differences in building construction make it impractical to draw assumptions for signal attenuation. Additionally, expanding unlicensed use as the Commission contemplates would make it difficult to determine the source of interference and whether the AFC system is working as planned.

APCO is generally supportive of additional interference mitigation measures suggested by the Commission, so long as new costs are not imposed on public safety users. Public safety operations must be protected from interference to the maximum extent possible.

II. Public Safety Spectrum Bands are Unsuitable for Unproven Spectrum Sharing Methods

APCO remains concerned that expanding unlicensed use in the 6 GHz band will cause harmful interference to public safety operations. As the Commission notes, the 6 GHz band is used for a variety of critical services, including public safety communications such as backhaul for first responder dispatch.⁶ Public safety fixed service operations are designed for availability times of 99.9999%, which means a downtime of no longer than 30 seconds per year.

Resynchronizing a fixed service receiver, even after a brief interference event, may require 15 minutes or more, unacceptably reducing the network availability time below that which public safety users require and have made substantial investments to achieve.⁷ Should the Commission's proposal fail to prevent the vast numbers of unlicensed devices operating in the band at varying power levels and unknown locations from causing interference, public safety agencies and the communities they serve will face irreparable harm.

Interference to public safety communications will not be identified until after a communications failure, putting safety of life and property at risk. Fixed service systems such as those relied upon by public safety for mission critical communications are not designed to detect interference and are incapable of attributing it to a particular source. These limitations would be compounded by the sheer number of unlicensed devices likely to be deployed in the 6 GHz band

⁶ NPRM at para. 9.

⁷ In the case of a P25 network, subsequent re-registration of mobile users may require an additional five minutes for reestablishing service.

and the fluctuating nature of unlicensed activity. Thus, identifying and resolving interference issues will be difficult, if not impossible under the Commission's proposal.

APCO is also concerned that the proposal will result in an elevated noise floor, degrading the performance of existing systems. In the case of public safety incumbents, this could introduce design complexities that substantially increase costs for microwave links in the 6 GHz band.⁸ Public safety agencies lack viable alternatives to the 6 GHz band. Higher frequency bands available for public safety use, such as 11 GHz, are not as useful given the shorter path lengths and susceptibility to signal attenuation from environmental factors such as rain.

If spectrum sharing methods are introduced into the 6 GHz band, such methods must have undergone substantial testing and been proven in advance to be effective at preventing interference to public safety communications. Public safety must be protected to the maximum extent possible, and afforded viable options to immediately resolve suspected interference.

III. Standard-Power Unlicensed Operation in the U-NII-5 and U-NII-7 Bands

The Commission proposes to allow the operation of unlicensed standard-power access points, which would be subject to an Automated Frequency Coordination (AFC) system, in the U-NII-5 and U-NII-7 sub-bands.⁹ These bands are heavily used and relied upon for fixed point-to-point microwave links essential to public safety services. The Commission must ensure that any AFC system implemented is designed to effectively protect new and existing public safety licensees from interference, and that any spectrum sharing methods used are thoroughly tested and proven in advance. In addition to the suggestions offered below in response to the Commission's proposals, APCO urges the Commission to prohibit any unlicensed standard-power access points or client devices from operating on frequencies where used by public safety

⁸ Ex Parte of APCO, GN Docket 17-183, at 1-2 (filed Mar. 29, 2018).

⁹ NPRM at para. 20.

– as well as adjacent and second-adjacent channels – for the first two years that any AFC system is in use. This prohibition will allow sharing methods to be live-tested in the 6 GHz band while mitigating the risk of new unlicensed uses to public safety operations.

A. Determining Permissible Frequencies of Operation

APCO agrees with the proposal that standard-power access points be prohibited from operating co-channel with any fixed link within that link’s exclusion zone, and further suggests that operating on channels adjacent and second-adjacent to public safety operations be prohibited.¹⁰ An access point should be required to obtain a list of permissible frequencies from an AFC system, and be restricted to those frequencies until receiving alternative authorization.¹¹ While a centralized AFC system would seem to facilitate more up-to-date, accurate database information and device verifications, APCO is open to alternative approaches.¹²

The Commission seeks comment on whether device registration in the AFC database is necessary.¹³ APCO urges the Commission to make device registration in the database mandatory for receiving permissible frequencies. Device registration will be helpful for managing standard-power access points and identifying and eliminating potential sources of interference. Registration should include information such as device location, device identification information, contact information for the device operator, and the device’s technical parameters (EIRP, antenna height above ground, bandwidth, etc.).

¹⁰ *Id.* at para. 23.

¹¹ *Id.* at para. 25. Obtaining a list of permissible frequencies, as opposed to prohibited frequencies, could be preferable in the event an access point only receives a portion of the list being sent.

¹² As technology advances, different approaches for an AFC system may become viable following substantial testing and evaluation. *See* Commissioner Jessica Rosenworcel, The FCC Should Use Blockchain to Manage Wireless Spectrum, *Wired* (Mar. 20, 2018) available at <https://www.wired.com/story/the-fcc-should-use-blockchain-to-manage-wireless-spectrum/>.

¹³ NPRM at para. 28.

The AFC database and standard-power access points will need regular updates. As the Commission notes, “the addition of new [fixed service] links or receive sites and changes to the frequency band of operation, receiver location, antenna type/directivity, and similar technical parameters will impact the list of frequencies the AFC system provides to standard-power access points.”¹⁴ To ensure the list of available frequencies is continually accurate, the AFC database should be updated to reflect any new, modified, or cancelled fixed service links as soon as that information is available, and no longer than every 24 hours. The AFC system should immediately update standard-power access points when changes to the permissible frequencies are made, and as an additional precaution, the access points should be required to periodically verify whether frequency availability has changed at least once every 24 hours.

Access points should be able to detect when they have moved and required to verify frequency availability prior to resuming transmissions.¹⁵ If the access point is unable to verify frequency availability, it should be required to automatically cease operation in the U-NII-5 and U-NII-7 bands within no more than 24 hours of its most recent verification and not resume operation until contact is restored.¹⁶ When determining available frequencies, if a standard-power access point lacks a wired connection to the AFC database, it should be required to perform its initial query of the database outside of the 6 GHz band, such as in the 2.4 GHz or 5.8 GHz band, in order to minimize the potential of interference.¹⁷

¹⁴ *Id.* at para. 29.

¹⁵ Access points should also be required to verify frequency availability prior to resuming transmissions after an interruption in power. As APCO notes elsewhere, requiring professional installation will help to ensure that access points are operating according to the AFC framework’s requirements.

¹⁶ APCO remains concerned that no matter how many contingencies are anticipated and planned for, once upwards of millions of unlicensed devices enter the stream of commerce, protections can fail or be defeated, leading to irreparable interference to vital public safety communications with no recourse. This is why APCO urges extreme caution with applying unproven spectrum sharing techniques in a band where public safety operates. The risks to public safety incumbents require a very different analysis as compared to the impacts of spectrum sharing techniques employed in bands with non-public safety incumbents.

¹⁷ Requiring access points to communicate with the AFC database via a wired connection could be a way to ensure that access points detect when they may have changed locations.

B. Designating an AFC System Operator

Entities interested in becoming an AFC system operator should be required to submit a proposal to the Commission that includes a description of how the database will be designed, including security measures, and measures that will be taken to prevent and quickly resolve reports of potential interference. Proposals should include information such as the technical expertise and business plan of the operator, the architecture of the database and its functions, and security measures that will be implemented.¹⁸ The Commission should then seek comment on the AFC system operator proposals to provide stakeholders with an opportunity to review key issues such as security measures and how incumbents will be protected from interference. As a condition of designation, the AFC system operator should be required to ensure that the AFC system undergoes substantial testing prior to being made available for use in the 6 GHz band.

i. Security Requirements

The AFC system and unlicensed devices in the U-NII-5 and U-NII-7 bands must adhere to strict security requirements given the potential for security failures to result in disruptions to public safety communications. APCO supports requiring security measures imposed on similar services¹⁹ as a starting point: to ensure that devices communicate only with authorized databases; that all communications and interactions between a database and devices are accurate and secure; that unauthorized parties cannot access or alter a database or the list of available frequencies sent

¹⁸ For reference, a white space administrator proposal showing included: 1) The entity's technical expertise to administer a database and its business plan to operate it for a five-year term; 2) The scope of the database functions the entity intends to perform and how it would synchronize data between multiple databases; 3) Diagrams of the architecture of the database system and a detailed description of how each function operates and interacts with the other functions; 4) Information on any other entities performing database functions and the business relationship between itself and these other entities, and; 5) The methods that will be used by devices to communicate with the database, the procedures that it plans to use to verify that a device can properly communicate with the database, and the security methods that will be used to ensure that unauthorized parties cannot access or alter the database. Unlicensed Operation in the TV Broadcast Bands, Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz band, ET Docket Nos. 04-186, 02-380, *Order*, 26 FCC Rcd 554, at para. 4 (2011).

¹⁹ See NPRM at para. 31.

to a device; that communications between devices and the database, and between different databases, are secure to prevent corruption or unauthorized interception of data; and that databases are protected from unauthorized data input or alteration of stored data.²⁰

ii. Advantage of a Single AFC System Operator

The Commission seeks comment on the number of AFC system operators that should be designated, and what procedures should be used for such designations.²¹ Designating a single AFC system operator would make identifying and resolving interference easier. For example, a single AFC system operator could be required to maintain a comprehensive log of transmission power and frequency use of standard-power access points. Reports of disruptions to licensed operations could then be correlated to this log to assist with interference investigations, with a centralized accountable party. If the Commission allows multiple AFC system operators, it must ensure that all operators have access to the full complement of accurate, up-to-date information about permissible frequencies and device registrations, and there is an efficient method for determining which operator has responsibility for an interfering access point.

iii. AFC Operator Requirements

The Commission proposes that if an AFC system ceases operation, it provides a minimum of 30-days' notice to the Commission and transfers its registration data to another AFC system operator.²² If there is a single AFC operator, the Commission must ensure that if AFC system operations cease or fail, there are mechanisms in place that will prevent interference from occurring. New unlicensed access points will constantly be entering the stream of commerce,

²⁰ In addition to requiring security measures related to database and device communications, the certification process for devices operating in the U-NII-5 and U-NII-7 bands should include thorough evaluation for compliance with any security and technical requirements of the AFC framework.

²¹ NPRM at paras. 33-34.

²² *Id.* at para. 35.

making it all the more essential that access points be prohibited from transmitting on 6 GHz channels until the AFC system provides a list of permissible frequencies and required to perform periodic verification. If there are multiple AFC operators, then, when one AFC system ceases operation, mechanisms must be in place to prevent errors in the transfer of responsibilities. This may include requiring all AFC operators to have access to a single, comprehensive database.

The Commission seeks comment on additional functions an AFC system operator should perform.²³ As described elsewhere in these comments, an AFC system operator should be responsible for resolving interference cases, particularly concerning reports from public safety licensees. Further, an AFC system operator should work with public safety frequency coordinators when developing the AFC system, for testing prior to unlicensed use of public safety frequencies, and for ongoing periodic audits of the system. Establishing such a relationship with public safety frequency coordinators, who inherently share a community of interest with public safety licensees, will further help to provide confidence that the AFC operator(s) does not act solely in the interests of commercial or business priorities.

C. Protecting Incumbents from Harmful Interference

i. Utilizing the Commission's Universal Licensing System

APCO agrees with the Commission's proposal that the AFC system use data from the Commission's Universal Licensing System (ULS) to facilitate access to available spectrum in the U-NII-5 and U-NII-7 bands.²⁴ ULS contains data sufficient for the AFC system's purposes, and

²³ *Id.*

²⁴ *See id.* at para. 39.

would have the added benefit of providing a single, authoritative source of licensees' information, which will promote data integrity.²⁵

The Commission seeks comment on how to address harmful interference that occurs when a station's ULS records are not up-to-date and whether the ULS records should be required to be updated before a remedy is available.²⁶ The first order of business is to immediately resolve any interference to public safety operations, regardless of the cause and without first requiring updates to ULS.

The Commission asks how the AFC system should take into account fixed service operations that are not individually licensed in ULS, such as temporary fixed operations authorized by a blanket authorization, and how to account for operation pursuant to conditional authority.²⁷ In addition, the Commission must also consider operations under special temporary authority, which public safety employs, particularly in the wake of disasters.²⁸ These scenarios present a significant challenge for the Commission's proposals, evidencing the need for more study before determining whether an AFC system could effectively protect public safety communications. An AFC system must be able to protect public safety operations without resulting in new administrative burdens or a loss of flexibility for public safety agencies.

ii. Interference Protection Criteria

The Commission seeks comment on what interference protection criteria should be adopted in the U-NII-5 and U-NII-7 bands.²⁹ For the metric, APCO prefers to use the ratio of interference to noise (I/N) power because it is simpler to apply than the ratio of the carrier to

²⁵ It may be beneficial for the Commission to explore ways to ensure the information used by an AFC system is accurate and up-to-date, for example, by allowing the use of private databases or establishing a temporary period to allow updates and corrections to ULS without fees.

²⁶ NPRM at para. 40.

²⁷ *Id.* at para. 41.

²⁸ 47 C.F.R. § 1.931.

²⁹ NPRM at paras. 42-43.

interference (C/I) power. More importantly, the Commission should specify interference protection criteria of no worse than I/N -6 dB, meaning a maximum noise floor degradation of 1 dB. A less stringent interference protection criteria would conflict with existing frequency coordination standards and would therefore result in unacceptable levels of interference.

iii. Adjacent Channel Protection

APCO urges the Commission to reconsider suggestions for protecting fixed links operating on adjacent and second-adjacent channels.³⁰ Contrary to the Commission's assumption, out-of-band emission limits do not adequately protect adjacent channel fixed service links.³¹ The AFC system must take this into account when identifying permissible channels for access points.

iv. Multipath Fading

APCO agrees with FWCC's characterization of the fade margins for fixed microwave links and strongly cautions the Commission against allowing supposed "excess fade margin" to be considered when determining the interference protection criteria.³² Fade margins are designed to ensure the requisite level of reliability, taking into account local climate and terrain factors. While fade variations throughout the day do follow patterns, they may not be sufficiently predictable for incorporation into an AFC system.³³ APCO urges the Commission to prohibit an AFC system from using this information for channel selection.

³⁰ *Id.* at para. 44.

³¹ *Id.*

³² *See id.* at para. 45.

³³ For example, while it is true that multipath fading is generally a nighttime phenomenon, severe multipath fading also occurs after local sunrise if the link path traverses relatively flat grassy terrain with dew on the ground and layers of ground fog.

v. Propagation Model

The Commission seeks comment on the appropriate propagation model for determining exclusion zones in the U-NII-5 and U-NII-7 bands.³⁴ The Commission proposes that a model should include clutter loss in addition to both line-of-sight and non-line-of-sight conditions in the first kilometer of the path and that, beyond the first kilometer, the propagation model should include a combination of a terrain-based path loss model and a clutter loss model appropriate for the environment.³⁵ APCO disagrees with the approach of using statistical propagation models for predicting average amounts of path loss. A statistical model underestimates path loss and therefore fails to take into account the cases most likely to cause interference. The chosen propagation model should take into account the actual clutter and terrain loss for each particular path. Absent reliable data about the individual path, a propagation model should assume free-space path loss.³⁶

vi. Standard-Power Access Point Height and Location

The Commission seeks comment on how to derive exclusion zones based on location information for standard-power access points to ensure fixed service protection.³⁷ APCO strongly opposes a two-dimensional exclusion zone approach unless the worst-case scenario is assumed for the vertical component. Using unknown or average access point heights would not

³⁴ NPRM at para. 49.

³⁵ *Id.*

³⁶ Further, the Commission should prohibit consideration of cross-polar isolation between unlicensed devices and microwave systems unless the combination of physical factors of the path would cause a near free-space propagation condition to exist. Standard-power access points and client devices will typically be operating in a multipath environment that results in substantial de-polarization effects. Such effects could be caused by diffraction or a reflection due to clutter, or reflections from flat terrain without clutter. *See* Telecommunications Industry Association, Telecommunications Systems Bulletin TSB-10-F, Interference Criteria for Microwave Systems, Annex F at F-4.7 (May 31, 1994).

³⁷ NPRM at paras. 50-52.

adequately prevent interference because in some cases an access point could have line-of-sight to fixed service receivers.

APCO recommends the Commission require a three-dimensional exclusion zone approach with individual elevation determinations for each access point. The AFC system should evaluate the worst-case value based on sufficiently stringent uncertainty measurements in each dimension. While APCO supports a geolocation capability requirement for standard-power access points, professional installation may be necessary for obtaining reliable location information in some situations.

The Commission seeks comment on requiring that every standard-power access point be professionally installed.³⁸ APCO supports a professional installation requirement. In addition to assisting with accurate location information, this could help to minimize the risk that members of the general public could defeat any of the numerous protections the Commission ultimately adopts to prevent interference to public safety operations. If access points are made ubiquitously available at retail locations for placement and operation by members of the general public, there is a risk that devices will not be installed, operated, or maintained in a manner consistent with the Commission's rules, resulting in interference that may be difficult, if not impossible, to reverse.

vii. Client Devices

The Commission proposes to require client devices that operate in the U-NII-5 and U-NII-7 bands to be under the control of a standard-power access point.³⁹ The Commission should prohibit client devices from transmitting in the 6 GHz band unless a device is actively associated with an access point that has verified permissible channels with the AFC system. Client devices

³⁸ *Id.* at para 52.

³⁹ *Id.* at para. 53.

should not otherwise transmit in the 6 GHz band, for probe requests or otherwise, in order to limit the possibility of interference.

The Commission seeks comment on the typical or maximum operating radius for communications between a client device and a standard-power access point, and asks how the distance should be incorporated into any frequency coordination computation to ensure incumbents are protected.⁴⁰ A frequency coordination computation should take into account the entire operational radius around the standard-access point, including the extended range of potential interference created by client devices.

IV. Low-Power Indoor Unlicensed Devices in the U-NII-6 and U-NII-8 Bands

In the U-NII-6 and U-NII-8 sub-bands, the Commission proposes to allow operation of unlicensed indoor-only low-power access points, without requiring the use of a frequency coordination system.⁴¹ The Commission anticipates that incumbent licensed services would be protected from harmful interference, in part due to significant building attenuation and clutter losses for transmissions originating from indoor devices.⁴² APCO disagrees with this assumption and opposes this proposal.

Restricting low-power access points to indoor use would be difficult, if not impossible. Even if an indoor-only limitation could be enforced, differences in building construction make it impractical to draw assumptions for signal attenuation. Public safety utilizes the U-NII-6 band for mobile and air-to-ground operations that will be more vulnerable to interference than fixed service receivers because the antennas are omnidirectional.⁴³ Further, operations in the U-NII-5

⁴⁰ *Id.* at para. 54.

⁴¹ *Id.* at para. 59.

⁴² *Id.* at para. 61.

⁴³ See Reply Comments of Massachusetts State Police, GN Docket No. 17-183, at 3 (filed Nov. 15, 2017); Comments of the American Association of State Highway & Transportation Officials, GN Docket No. 17-183, at 5 (filed Oct. 2, 2017).

and U-NII-7 bands are susceptible to interference from adjacent frequencies. Thus, the Commission's proposal for the U-NII-6 and U-NII-8 bands poses a threat to public safety communications. If the Commission pursues unlicensed operations in these bands, it should prohibit co-channel, adjacent channel, and second-adjacent channel operation with public safety licensees and consider requiring the use of an AFC system.

V. Other Unlicensed Operation Options

A. Low-Power Indoor Operation in the U-NII-5 and U-NII-7 Bands

The Commission seeks comment on whether indoor-only low-power access point operations should be permitted in the U-NII-5 and U-NII-7 bands without the need for authorization from an AFC system.⁴⁴ APCO opposes this proposal. As noted above, restricting low-power access points to indoor use would be difficult if not impossible, and differences in building construction make it impractical to draw assumptions for signal attenuation. Further, expanding unlicensed use in these bands would make it difficult to determine the source of interference and whether the AFC system is working as planned.

APCO takes issue with the suggestion that proposals for unlicensed operations should be evaluated based on whether they pose a "material risk" of harmful interference to incumbent links.⁴⁵ This standard is unacceptable. Levels of interference that are tolerated for commercial uses of spectrum do not translate to public safety, where the lives of responders and their communities may be impacted by interference to communications.

B. High Power Operation in the U-NII-6 and U-NII-8 Bands

APCO opposes allowing unlicensed operations in the U-NII-6 or U-NII-8 bands to operate at the same, higher power levels as those proposed for the U-NII-5 and U-NII-7 bands,

⁴⁴ NPRM at para. 73.

⁴⁵ *Id.*

both indoors and outdoors.⁴⁶ Without a database that requires device registration, there is no method for tracking the number or location of access points operating. Further, a lack of coordination, combined with the number of devices that may be introduced, would make controlling these devices and identifying and resolving interference impossible.

C. Mobile and Transportable Operation

The Commission seeks comment on whether unlicensed devices in the U-NII-5 and U-NII-7 bands, under control of the AFC system, should be permitted to operate either as a mobile hotspot or as a transportable device.⁴⁷ APCO opposes allowing client devices to operate in the U-NII-5 and U-NII-7 bands as mobile or transportable hotspots that provide Wi-Fi connections to other nearby devices. Even if the devices were under the control of an AFC system, their mobile nature would make identifying and resolving interference virtually impossible.

VI. Technical Rules

A. Power Limits

The Commission proposes to adopt power levels for 6 GHz unlicensed devices similar to those currently permitted in existing U-NII bands.⁴⁸ Notwithstanding concerns expressed throughout these comments, APCO agrees in principle with the Commission's proposed power limits for access points operating under an AFC system and client devices.⁴⁹

The Commission seeks comment on whether higher power operations could be permitted in rural and underserved areas under certain conditions.⁵⁰ APCO opposes allowing higher power unlicensed operations in rural areas at this time. Public safety links in rural areas are often the

⁴⁶ See *id.* para. 74.

⁴⁷ *Id.* at para. 76.

⁴⁸ *Id.* at para. 78.

⁴⁹ As noted above, APCO opposes the Commission's proposal for uncoordinated indoor-only use in the U-NII-6 and U-NII-8 bands.

⁵⁰ NPRM at para. 79.

only viable option for providing connectivity and should be afforded the same protection as operations in other areas.

APCO opposes allowing unlicensed point-to-point and point-to-multipoint operations at this time.⁵¹ These types of operations would substantially complicate the unlicensed frequency coordination process by requiring the AFC database to take into account azimuth and elevation angles. The Commission should ensure that the AFC system can successfully protect public safety operations from harmful interference from standard-power access points and client devices at more basic operations before giving further consideration to unlicensed point-to-point and point-to-multipoint systems.

B. Prohibition on Use in Moving Vehicles and Unmanned Aircraft Systems

The Commission proposes to prohibit operation of unlicensed access points in moving vehicles such as cars, trains, and aircraft, and the operation of unlicensed access points and client devices on unmanned aircraft systems (UAS).⁵² APCO agrees with these proposals. At the same time, APCO is interested in exploring how such prohibitions would be enforced.

VII. Additional Mitigation Measures

The Commission seeks comment on a number of additional mitigation measures to ensure that harmful interference from unlicensed operations is expeditiously resolved.⁵³ APCO is generally supportive of additional mitigation measures, so long as they do not result in new costs for public safety users.

⁵¹ *Id.*

⁵² *Id.* at paras. 84-85.

⁵³ *Id.* at paras. 86-91.

A. Digital Identifying Information

The Commission seeks comment on whether standard-power access points should be required to transmit digital identifying information.⁵⁴ APCO does not object to a digital identification requirement, provided the Commission does not require fixed receivers to be able to decode digital identifications. FWCC is correct that, as interference is not detected until after a communications link fails, it would be very difficult to pinpoint the cause of the interference, and fixed service operators would not be able to decode the access point identifying information.⁵⁵ A digital identification requirement may be helpful in the prolonged process of identifying interference, but adding this feature to new public safety equipment or retrofitting existing equipment would impose unreasonable costs. The Commission should consider inviting entities seeking to serve as AFC system operators to describe a process for investigating reports of link failure that leverages digital identification decoding as one of several techniques.

B. Band In-Use Database

The Commission also seeks comment on requiring that the AFC system record the actual frequency being used by each standard-power access point.⁵⁶ Again, while recording the frequency in use could be helpful for an investigation, this should be one of many tools available for an AFC system operator to resolve reports of potential interference. As mentioned above, reports of disruptions to licensed operations could be correlated to a log of frequencies used by unlicensed devices to assist with what is likely to be a prolonged process for interference investigations.

⁵⁴ *Id.* at paras. 87-88.

⁵⁵ *Id.* at para. 87 (citing Ex Parte Letter of FWCC, GN Docket 17-183, at 16 (filed Jun. 8, 2018)).

⁵⁶ *Id.* at para. 89.

C. Interference Resolution Process

The Commission seeks comment on whether it would be necessary to institute an interference resolution process beyond the existing rule for unlicensed devices.⁵⁷ APCO generally agrees that the operator of an unlicensed device should be required to cease operating the device immediately upon notification that the device is causing or may be causing interference, and not resume until the condition causing the interference has been corrected. However, the critical nature of licensed communications in the 6 GHz band dictates going further than the existing rule for unlicensed devices. The Commission should consider options to expedite the process with a practical view of the limited tools available to detect and identify interference to licensed users.

D. Informational Requirements

The Commission seeks comment on whether it should require manufacturers to provide consumers with information on any specific operational requirements applicable to devices operating in the U-NII-5 through U-NII-8 bands to prevent harmful interference.⁵⁸ Doing so is not a reliable way to prevent misuse. There is no way to be certain that consumers will apprise themselves of or adhere to such information.

Given the limited options for public safety licensees in the 6 GHz band to identify and mitigate interference, the Commission must take an aggressive approach to ensuring an AFC system is proven to be effective in advance and as the spectrum environment evolves.

⁵⁷ *Id.* at para. 90.

⁵⁸ *Id.* at para. 91.

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