



PUBLIC NOTICE

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OET ANNOUNCES COMMENCEMENT OF TESTING OF THE 6 GHz BAND AUTOMATED FREQUENCY COORDINATION SYSTEMS

ET Docket No. 21-352

By the Chief, Office of Engineering and Technology:

I. INTRODUCTION

1. The Office of Engineering and Technology (OET) will permit testing for the automated frequency coordination (AFC) systems that will manage access to 6 GHz band spectrum by standard power unlicensed devices to commence. Previously, OET conditionally approved thirteen entities to operate AFC systems conditioned on each system undergoing a rigorous testing process. This Public Notice provides information on the AFC system testing process. This process will require that the AFC systems undergo both lab testing and a public trial. Once the conditionally approved AFC systems have successfully completed the testing process, OET will approve them for full commercial operation.¹

II. BACKGROUND

2. On April 23, 2020, the Commission adopted a Report and Order and Further Notice of Proposed Rulemaking (*6 GHz Report and Order*) that made broad swaths of the 6 GHz band (5.925–7.125 GHz) available for expanded unlicensed operations.² The *6 GHz Report and Order* adopted rules for two different types of unlicensed operations—standard-power operations and low-power indoor operations.³ For standard-power operations, standard-power access points and fixed client devices operate under the control of AFC systems in two portions of the 6 GHz band—the U-NII-5 band (5.925-6.425 GHz) and the U-NII-7 band (6.525-6.875 GHz).⁴ The U-NII-5 and U-NII-7 bands are heavily used by licensed point-to-point microwave systems.⁵ In addition, the 6.65-6.6752 GHz portion of the U-NII-7

¹ To the extent possible, OET will aim to approve multiple AFC systems concurrently. However, OET will not delay approval of AFC systems that successfully complete testing if issues arise during testing that may significantly delay other AFC systems from obtaining approval.

² *Unlicensed Use of the 6 GHz Band*, ET Docket No. 18-295, Report and Order and Further Notice of Proposed Rulemaking, 35 FCC Rcd 3852 (2020) (*6 GHz Report and Order*).

³ *Id.* at 3860, paras. 17-18.

⁴ 47 CFR § 15.407(k)(1); *6 GHz Report and Order*, 35 FCC Rcd at 3860, 3862, 3923, paras. 17-18, 22, 192. Only standard-power and fixed-client 6 GHz unlicensed devices are required to operate pursuant to an AFC system. 47 CFR § 15.407(k)(1). Standard-power devices may operate both outdoors and indoors at power levels above the low-power indoor device power limits. *Id.* § 15.407(a)(4). A fixed client device is “intended as customer premise equipment that is permanently attached to a structure, operates only on channels provided by an AFC, has a geolocation capability, and complies with antenna pointing angle requirements.” 47 CFR § 15.403.

⁵ *6 GHz Report and Order*, 35 FCC Rcd at 3855, para. 7.

band is used for radio astronomy observations at a limited number of observatories.⁶ The AFC systems will manage spectrum access for standard-power access points and fixed client devices to prevent harmful interference from occurring to the microwave systems and radio astronomy observatories.⁷

Unlicensed Use of the 6 Gigahertz Band

Device Class	Operating Bands	Maximum EIRP	Maximum EIRP Power Spectral Density
Standard-Power Access Point (AFC Controlled)	U-NII-5 (5.925-6.425 GHz) U-NII-7 (6.525-6.875 GHz)	36 dBm	23 dBm/MHz
Fixed Client (AFC Controlled)		36 dBm	23 dBm/MHz
Client Connected to Standard-Power Access Point		30 dBm	17 dBm/MHz
Low-Power Access Point (indoor only)	U-NII-5 (5.925-6.425 GHz) U-NII-6 (6.425-6.525 GHz) U-NII-7 (6.525-6.875 GHz)	30 dBm	5 dBm/MHz
Client Connected to Low-Power Access Point	U-NII-8 (6.875-7.125 GHz)	24 dBm	-1 dBm/MHz

3. The *6 GHz Report and Order* specified a multi-stage process laying out the steps that OET must follow to approve AFC systems.⁸ The first requirement directed OET to issue a public notice soliciting proposals from prospective AFC system operators while providing an opportunity for the public to comment on the proposals.⁹ OET was then directed to conditionally approve applicants who demonstrate their proposed AFC systems will comply with all AFC requirements.¹⁰ Applicants who receive conditional approval are then required to provide a test system that will be subject to a public trial period, which will include thorough testing in both a controlled environment and through demonstration projects.¹¹

4. On September 28, 2021, the Commission issued a Public Notice requesting proposals from prospective AFC system operators.¹² In response to the Public Notice, the Commission received fourteen

⁶ *Id.* at 3884, para. 87.

⁷ 47 CFR § 15.407(l), (m); *6 GHz Report and Order*, 35 FCC Rcd at 3862, para. 22.

⁸ *6 GHz Report and Order*, 35 FCC Rcd at 3870-71, para. 49.

⁹ *Id.*

¹⁰ *Id.* at 3871, para. 49.

¹¹ *Id.*

¹² *The Commission Begins the Process for Authorizing 6 GHz Band Automated Frequency Coordination Systems*, ET Docket No. 21-352, Public Notice, FCC 21-100, 2021 WL 4500447, at *1, *3, *4, paras. 2, 7, 10 (Sept. 28, 2021).

applications to operate AFC systems as well as eight comments regarding the applications.¹³ One applicant, Amdocs, later withdrew their application.¹⁴

5. On November 2, 2022, OET issued a Public Notice (2022 Public Notice) conditionally approving the thirteen remaining applicants to operate AFC systems: Broadcom, Google, Comsearch, Sony Group, Kyrio, Key Bridge Wireless, Nokia Innovations, Federated Wireless, Wireless Broadband Alliance, Wi-Fi Alliance (WFA), Qualcomm, Plume Design, and RED Technologies.¹⁵ OET indicated in the Public Notice that these conditionally approved AFC systems will not be available for commercial operations until they receive final approval from OET.¹⁶ To receive final approval the AFC systems will be required to undergo lab testing and demonstration project(s).¹⁷ While the 2022 Public Notice did not provide details on this required testing, it did provide preliminary information to enable the AFC system applicants to begin preparing for the testing process.

III. AFC SYSTEM TESTING

6. As directed by the *6 GHz Report and Order*, OET requires that the conditionally approved AFC systems undergo rigorous testing, both in a controlled environment and through a demonstration project before we will approve them for commercial operations.¹⁸ As OET indicated in the *2022 Public Notice*, the controlled environment testing shall consist of testing conducted by a third-party test lab using a set of tests to be specified by OET.¹⁹ The *2022 Public Notice* also announced our intent to require each of the AFC system applicants to conduct a public trial as a demonstration project where they make a website available that provides an opportunity for members of the public to test the functionality of their AFC system.²⁰ OET now provides details regarding the required lab testing and the public trial. The AFC system applicants may commence testing their AFC systems.

A. Lab Testing

7. *Lab Test Plan*: The Wi-Fi Alliance developed a plan for testing AFC systems.²¹ This test plan provides that the test lab will perform the following tests to validate AFC systems' functionality:

- Successful registration of a standard-power device with the AFC system:²² The AFC system is sent a spectrum request containing all the information required by the Commission's rules and returns a response indicating successful registration.

¹³ See the 14 applications to operate AFC systems filed in ET Docket No. 21-352 between October 28, 2021, and November 11, 2021. APCO International; the Utilities Technology Council and Edison Electric Institute; Wi-Fi Alliance; Dynamic Spectrum Alliance; Verizon; AT&T Services; Apple, Broadcom et al.; and the Fixed Wireless Communications Coalition (FWCC) filed comments in ET Docket No. 21-352 on December 21, 2021.

¹⁴ Amdocs March 25, 2022 *Ex Parte* at 1.

¹⁵ *OET Announces Conditional Approval for 6 GHz Band Automated Frequency Coordination Systems*, ET Docket 21-352, Public Notice, DA 22-1146, 1, para. 1 (Nov. 2, 2022) <https://www.fcc.gov/document/oet-announces-conditional-approval-6-ghz-band-afc-systems> (2022 *Public Notice*).

¹⁶ *Id.* at 4, para. 5.

¹⁷ *Id.* at 19-20, para. 41.

¹⁸ *6 GHz Report and Order*, 35 FCC Rcd at 3871, para. 49.

¹⁹ *2022 Public Notice* at 19-20, paras. 41-42.

²⁰ *2022 Public Notice* at 21-22, para. 45.

²¹ *Wi-Fi Alliance AFC System (SUT) Compliance Test Plan Version 1.5*, available at <https://www.wi-fi.org/discover-wi-fi/6-ghz-afc-resources>.

²² *Id.* at 12-13.

- Unsuccessful registration of a standard-power device with an AFC system:²³ The AFC system is sent a spectrum request which is missing information that is required by the Commission’s rules such as the FCC identifier, manufacturer’s serial number, geographic coordinates, uncertainty of the geographic coordinates, and antenna height. The AFC system returns a response indicating no available frequencies or channels.
- Fixed service protection:²⁴ The AFC system is sent a series of spectrum requests for different geographic coordinates, heights, and location uncertainties which are referred to as “test vector inputs.” The AFC system will calculate the available frequencies and permitted transmit power levels using the appropriate propagation models for each test vector which will be compared to independently calculated “test vector outputs.”
- International border protection:²⁵ The AFC system is sent a series of spectrum requests for locations in the vicinity of international borders. The AFC system will calculate the available frequencies and permitted transmit power levels using the appropriate propagation models for each test vector which will be compared to independently calculated test vector outputs.
- Protection of radio astronomy locations:²⁶ The AFC system is sent a series of spectrum requests for locations that are in the vicinity of radio astronomy observatories which must be protected in the 6650-6675.2 MHz frequency range. The AFC system returns available frequencies which do not include this frequency range.

8. OET finds that this test plan is appropriate for lab testing AFC systems. The test plan focusses on the main function of the AFC systems, which is protecting incumbent fixed service stations and radio astronomy observatories. Wi-Fi Alliance and the Wireless Innovation Forum (WinnForum) developed and recently released a set of test vector inputs and corresponding test vector outputs.²⁷ To illustrate that these test vectors adequately test the functionality of the AFC system, WinnForum created a traceability matrix which maps the test vector inputs to the requirements for the AFC system that are identified in the WinnForum’s AFC system functional requirements document.²⁸ The functional requirements document is a technical standard for AFC systems based on the Commission’s rules.²⁹ As the traceability matrix illustrates, the test vector inputs will exercise the AFC systems over a wide range of conditions comprising locations requiring all three specified propagation models (free space, Winner II, and Irregular Terrain Model) to be used, different environments (urban, rural, and suburban), and different fixed microwave antenna heights.³⁰ These test vectors have been designed to exercise the full variety of propagation environments and microwave link characteristics that can occur in practice to verify that the AFC system is protecting those links from harmful interference in accordance with the Commission’s rules.

²³ *Id.* at 13-14.

²⁴ *Id.* at 14-16.

²⁵ *Id.* at 16-17.

²⁶ *Id.* at 17-19.

²⁷ *AFC System (SUT) Compliance Test Vectors v1.2*, Wi-Fi Alliance, available at <https://www.wi-fi.org/discover-wi-fi/6-ghz-afc-resources>.

²⁸ *Traceability Matrix*, WinnForum, ET Docket 21-352, filed Dec. 1, 2022; *Functional Requirements for the U.S. 6 GHz Band under the Control of an AFC System*, WinnForum, ET Docket 21-352, filed Oct. 31, 2022.

²⁹ *Functional Requirements for the U.S. 6 GHz Band under the Control of an AFC System*, WinnForum, ET Docket 21-352, filed Oct. 31, 2022 at 7.

³⁰ *AFC System (SUT) Compliance Test Vectors v1.2*, Wi-Fi Alliance, available at <https://www.wi-fi.org/discover-wi-fi/6-ghz-afc-resources>.

9. We reviewed these test vectors and conclude that they effectively test the functionality of the AFC systems for a variety of conditions. Based on this review, we will permit conditionally approved AFC systems to commence lab testing upon release of this Public Notice.³¹ Test labs can now use the Wi-Fi Alliance test plan with these test vectors to examine AFC system operations. The test lab will create a test report describing the results of each test performed and the AFC system applicant will file that report in ET Docket No. 21-352.³² OET will examine the test report and either issue a notice that we are satisfied that the AFC system has successfully passed the lab test or we may require the AFC system applicants to provide additional information or make modifications to their AFC system to correct any deficiency that is indicated by the test results.

10. We are confident that lab test results consistent with the test vectors will provide assurance that the AFC systems have been implemented in accordance with the Commission's rules. In addition to illustrating that the calculations needed to determine frequency availability and permitted power levels are in accordance with the specified propagation models and interference protection criteria, the test plan also verifies that the AFC systems are properly registering standard-power devices and are taking into account the nation's border regions.

11. *Test Labs*: To provide flexibility for AFC system applicants, OET is providing two eligibility options for determining which test labs may conduct the required AFC system lab testing. First, OET is permitting FCC-recognized accredited testing laboratories that have also been approved through WinnForum's Citizens Broadband Radio Service Device (CBSD) testing and certification program to conduct the lab testing.³³ FCC recognized accredited testing laboratories are organizations which conduct testing required for devices to obtain certification under the Commission's equipment authorization rules.³⁴ Typically, this testing involves conducting radio frequency measurements to determine conducted power levels and out-of-band emissions rather than software testing. However, FCC recognized accredited testing laboratories that have been approved through WinnForum's CBSD testing and certification program already have experience using specific test software and a test harness to ensure that the CBSDs operate under the control of a spectrum access system. WinnForum developed a similar test harness to conduct AFC testing.³⁵ Because the software for AFC testing is similar to that used for CBSD testing, OET believes the testing laboratories that conduct the CBSD testing have the necessary experience and expertise to conduct AFC system lab testing.

12. To provide additional options for AFC testing, OET is also permitting test labs that have been accredited by WinnForum to conduct AFC system lab testing.³⁶ Under the accreditation process created by WinnForum, a prospective test lab can submit an application to WinnForum that includes proof of ISO/IEC 17025 accreditation to the WinnForum 6 GHz AFC system test plans, an overview of the test lab

³¹ We reserve the right to make additions or subtractions to the set of test vectors or modify one or more of them, as appropriate, during the course of the lab testing process.

³² Because these test reports are in the public interest and simply report test results along with any actions that may have been taken to modify an AFC system to ensure compliance, we do not expect that they will contain proprietary or company specific non-public information. Thus, they will be available for public inspection.

³³ A list of FCC recognized accredited testing laboratories can be found at <https://apps.fcc.gov/oetcf/eas/reports/TestFirmSearch.cfm>. As of May 20, 2022, there are 569 FCC recognized accredited testing laboratories. A list of WinnForum-approved CBSD test labs can be found at <https://cbars.wirelessinnovation.org/cbsd-certification-program>.

³⁴ 47 CFR §§ 2.907, 2.948; *Accredited Testing Laboratory Program Roles and Responsibilities*, Office of Engineering and Technology, KDB Publication 974614 D01 (Apr. 2, 2019), https://apps.fcc.gov/kdb/GetAttachment.html?id=koP7QuHnAbqrT0URaUjRBw%3D%3D&desc=974614%20D01%20Accredited%20Test%20Lab%20Roles%20and%20Resp%20v05r01&tracking_number=44684.

³⁵ Wi-Fi Alliance and WinnForum Oct. 20, 2022 *Ex Parte* ET Docket No. 21-352 at 6.

³⁶ 2022 *Public Notice* at 21, para. 44.

including its experience with the test modules, the resumes of the lab's subject matter experts and engineers who will be involved with the testing, a demonstration of execution of the test harness software, a written description of the test procedures, a test report template, and a valid set of sample test vectors representative of additional tests that the test lab may run.³⁷ A task group of industry stakeholders operating independently of WinnForum and not including representatives of the candidate test labs will review the application to ensure all requirements are satisfied.³⁸ OET believes that this rigorous process will ensure that approved test labs are capable of conducting the lab testing.

B. Public Trial

13. To further test AFC system functionality, OET is requiring, in addition to lab testing, AFC systems be subject to a public trial period. During this public trial period each AFC system applicant will be required to make their AFC system available on the Internet to provide any interested member of the public an opportunity to test the AFC system functionality. This public testing satisfies the Commission imposed requirement in the *6 GHz Report and Order* that conditionally approved AFC system applicants "provide a test system that will be subject to a public trial period to provide interested parties an opportunity to check that [the AFC system] provides accurate results."³⁹ In accordance with the testing requirements in the *6 GHz Report and Order*, the public trial may be conducted concurrently with the lab testing.

14. The AFC system applicant must provide clear instructions for users regarding use of the test portal and how to enter test vectors either individually or in batch (if such functionality is made available). The test portal must also contain clear information instructing users how to seek help or get questions answered if issues using the test portal arise. It must also provide capability for users to enter test locations for anywhere within the United States, including U.S. territories and possessions. The input information should include the latitude, longitude, and height of the test location, the location uncertainty in the horizontal plane (i.e. latitude and longitude), and the height uncertainty. The website should permit the user to specify the horizontal location uncertainty using any of the methods permitted by the *AFC System to AFC Device Interface Specification*.⁴⁰ The AFC system under test must then return a list of the frequency ranges on which a standard-power device at that location would be able to transmit and the corresponding maximum power level for each frequency range.

15. The Internet-based test portal must also provide a means for users to submit challenges to the AFC system applicant if the user believes that the available frequency ranges and power levels are not in compliance with the Commission's rules. This functionality can be implemented either by direct entry within the test portal or by submitting an email. A challenge should include contact information such as an email or phone number for the party challenging the results as well as an explanation describing why it believes the returned available frequencies and/or power levels are believed to be incorrect. An AFC system applicant may contact the party challenging the results if additional information regarding the challenge is needed. The AFC applicant must respond to the challenger with an explanation of why it either believes the challenge raises a valid concern or is without merit.

16. OET will permit AFC system applicants to either work together to jointly operate a public trial test portal as a single point of entry for testing multiple AFC systems or to operate individual test

³⁷ *Wireless Innovation Forum Authorized AFC System Test Lab Requirements*, Version 1.0.0, August 4, 2022, <https://6ghz.wirelessinnovation.org/assets/WINNF-TS-5009-V1.0.0%206%20GHZ%20AFC%20System%20ATL%20Requirements%20Specification.pdf> at 3.

³⁸ *Id.*

³⁹ *6 GHz Report and Order*, 35 FCC Rcd at 3870-71, para. 49.

⁴⁰ The location uncertainty may be specified as 1) an ellipse with a specified center point and major and minor axis lengths; 2) a polygon with specified vertices; or 3) a polygon identified by its center and array of vectors. *AFC System to AFC Device Interface Specification*, Version 1.5, Wi-Fi Alliance, 14-15. Available on the Wi-Fi Alliance website at <https://www.wi-fi.org/discover-wi-fi/6-ghz-afc-resources>.

portals. Providing a single test portal for multiple AFC systems would benefit the public by providing a means to test multiple AFC systems with identical coordinates at the same time making it easy to compare the outputs returned by the different AFC systems. However, OET appreciates that requiring the AFC system applicants to jointly create a test portal could be complex and not all AFC systems may be complete and ready for testing in the same timeframe. Therefore, while OET believes a single point of entry for testing all AFCs has many benefits for the public, we will not require such a system and will permit each AFC system applicant the option of using a common Internet-based test portal with other AFC systems or setting up its own public trial test portal.

17. The public trial test portals must be accessible to the public for a minimum of forty-five days. At least one week before the portal becomes accessible, the AFC applicant must file a notice in ET Docket Number 21-352 stating when the test portal will become available and provide a URL for accessing it. The AFC applicant must be capable of accepting challenges to the available frequencies and/or permitted power levels returned by the website for fifteen days after the end of this forty-five day period. This will provide users sufficient time to analyze all test results and launch challenges, if appropriate. All dates, including test start date, end date, and end of the challenge period must be clearly specified on the test portal.

18. Once the deadline for submitting challenges has expired, the AFC applicant must prepare a report describing the public trial. This report must include statistics regarding the number of public tests conducted as well as additional data as the AFC applicant deems appropriate. In addition, the report must include a summary of each challenge received, and an explanation as to why the challenge did or did not raise a valid concern with the functionality of the AFC system. If the challenge did raise a valid concern, the report must explain the actions the AFC system applicant took or is taking to resolve this concern as well as the date on which any software changes were completed or are expected to become complete. If the software changes have already been completed, the AFC applicant must provide evidence that the updated AFC system under test adequately addresses the concern(s) raised in the challenge(s). If the software has not yet been updated, the AFC applicant must file a supplemental report once the AFC system software is updated and fully tested and provide evidence that the updated AFC system under test has corrected the issue(s) identified by the challenge(s). The AFC applicant must file these reports in ET docket No. 21-352.⁴¹ OET will examine the public trial reports and may require AFC system applicants to provide additional information or make modifications to their AFC system if necessary to correct any deficiency that may still remain or correct any other issues that may arise during the public trial.

C. Additional Testing Not Necessary

19. In the *2022 Public Notice*, OET indicated that it was considering requiring AFC system applicants to conduct an AFC system integration test.⁴² OET envisioned that such testing could verify that deployed standard power devices operate under the control of the AFC systems on the appropriate channels and at the specified power levels. The *2022 Public Notice* referred to the Initial Commercial Deployment (ICD) required for the Spectrum Access Systems (SAS) that control spectrum access in the CBRS band (3550-3700 MHz) as one possible model for integration test.⁴³ OET concludes that additional AFC system testing beyond the lab testing and public trial is not necessary.

20. Several commenters express the need for additional AFC testing such as field testing or end-to-end testing. For example, AT&T suggests that AFC applicants provide a list of test locations for field

⁴¹ Because these test reports are in the public interest and simply report test results along with any actions that may have been taken to modify an AFC system to ensure compliance, we do not expect that they will contain proprietary or company specific non-public information. Thus, they will be available for public inspection.

⁴² *2022 Public Notice* at 22, para. 48.

⁴³ *2022 Public Notice* at 22-23, para. 49 citing *Wireless Telecommunications Bureau and Office of Engineering and Technology Establish Procedure and Deadline for Filing Spectrum Access System Initial Commercial Deployment Proposals*, Public Notice, GN Docket No. 53-319, 33 FCC Rcd 7390 (2018).

test.⁴⁴ According to AT&T, “OET should make clear that an AFC system will be deemed to provide ‘accurate results’ within the meaning of the *6 GHz Report and Order* only if it is validated as compliant with the Commission’s rules on an end-to-end basis and fully protects primary FS licensees.”⁴⁵ Verizon advocates selecting one or more representative real-world fixed links for testing purposes.⁴⁶ APCO points out that “OET has not confirmed that the process for testing AFC systems will entail real world testing with standard power devices . . .”⁴⁷ The International Association of Fire Chiefs request that any testing be either conducted or verified by a federal entity, such as the National Institute of Standards and Technology’s Public Safety Research Division.⁴⁸

21. Commenters also express an interest in permitting incumbents to either be involved in the testing process or have additional input into the process. UTC and the Edison Electric institute jointly advocate that AFC system proponents allow incumbent licensees full transparency into the configuration and operations of their systems through field and lab testing stating that access to a “black box” that generates some results is insufficient to demonstrate incumbents will be protected from harmful interference.⁴⁹ According to Verizon, incumbent licensees need to be able to test AFC systems in a way that provides confidence that fixed links will be protected.⁵⁰ FWCC requests that information about planned testing be made available in advance of the test period to allow interested parties to propose additional testing, if necessary, to help prepare tests that will rigorously demonstrate the AFC system’s compliance with the Commission’s rules.⁵¹ APCO suggest that if the AFC approval process continues, it should be for the purpose of conducting field tests in collaboration with public safety licensees to develop AFC system parameters and procedures to identify and eliminate interference.⁵²

22. OET is not convinced that additional testing beyond the lab testing and public trial we are requiring is needed. The testing process is intended to verify that the AFC systems are operating in conformance with the rules which the Commission adopted. In the *6 GHz Report and Order*, the Commission concluded that the rules that require standard power devices to operate under the control of an AFC system will prevent harmful interference from occurring to incumbent fixed microwave links as well as radio astronomy sites.⁵³ These rules establish that the AFC system is to use microwave link information from the Commission’s Universal Licensing System, and the propagation models and the interference protection criteria specified by the Commission to determine the frequencies and power levels at which the standard-power devices may operate.⁵⁴ The lab testing, which will involve exercising the AFC systems with a set of test vectors that cover the full range of possible conditions, will achieve the goal of verifying the AFC system operations are in accordance with Commission’s rules. The public trial, which will allow all interested parties to explore the outputs of the AFC systems, will provide additional assurance as to the correct operation of the AFC systems.

⁴⁴ AT&T Comments at 27-28.

⁴⁵ AT&T April 26, 2022 *Ex Parte* at 13.

⁴⁶ Verizon Comments at 14.

⁴⁷ APCO International Dec. 7, 2022 *Ex Parte* at 3.

⁴⁸ International Association of Fire Chiefs January 11, 2021 *Ex Parte* at 2.

⁴⁹ UTC/EEI Comments at 7.

⁵⁰ Verizon May 16, 2022 *Ex Parte* at 4.

⁵¹ FWCC Comments at 9.

⁵² APCO International May 31, 2022 *Ex Parte* at 3.

⁵³ *6 GHz Report and Order*, 35 FCC Rcd at 3862, para. 22.

⁵⁴ 47 CFR §§ 15.407(k)(3), (l).

23. OET does not believe there will be any utility in requiring end-to-end testing that includes both AFC systems and standard power devices. The lab testing and public trial will verify that the AFC systems are generating available frequencies and permitted power levels that are appropriate under the Commission's rules while the equipment authorization process will check that the standard power devices are operating as instructed by the AFC system commands.⁵⁵ Furthermore, OET disagrees with APCO's suggestion that the purpose of field testing should be to develop AFC system parameters or develop procedures for identifying and eliminating interference. In adopting the 6 GHz rules the Commission did not task OET with requiring testing for such purposes.

24. OET has sufficient real-world experience with database controlled systems to be confident that they work as intended to support the conclusion that integration testing is not necessary. First, AFC systems are much simpler than the SAS systems used in CBRS because AFC systems are not a fully dynamic system managing near real-time frequency assignments based on constantly changing inputs. AFC systems are also simpler than the white space databases because they do not need to account for the possibility of protecting short term registration based wireless microphones. In contrast, AFC systems must protect fixed microwave links pursuant to licensing records contained in ULS. Moreover, unlike other database enabled systems, each AFC system operates independently and is not required to coordinate with other AFC systems. Thus, once device testing is conducted which verifies that the 6 GHz standard power device correctly communicates and executes the commands provided by the AFC system, and once lab testing and public trials of the AFC system are conducted and deemed acceptable, additional testing such as integration testing involving operation of actual standard power devices in the field will provide no additional information about the correct operation of the AFC system than what will be available from all prior testing. Additional testing beyond the lab testing and public trial would only delay the availability of standard power devices to the American public without providing any significant benefits and would not be in the public interest.

25. OET also sees no reason for additional involvement by the incumbents in the testing process. Because the lab testing will be performed by an independent test lab that is either FCC recognized or has undergone a rigorous approval process by the WinnForum, OET has confidence that the testing will be done in a thorough and accurate manner. Nor is there any reason to conclude that testing by a recognized test lab that has tested sophisticated CBSDs would be in any way inferior to testing performed by a government entity. The public trial requirement, which will permit any interested party to exercise the AFC systems, will provide additional assurance that the AFC systems are being adequately tested. OET also sees no reason to allow time for interested parties to provide additional input into the testing process. There has been ample opportunity to provide input into the process since the Commission solicited AFC system proposals on September 28, 2021 and OET sees no reason to create additional delays by soliciting further input on AFC testing.

IV. ADDITIONAL ISSUES

26. *Canadian Requirements*: AT&T urges the Commission to condition final approval of the AFC systems on compliance with requirements that the Canadian spectrum regulator, Innovation, Science, and Economic Development Canada (ISED), adopted for AFC systems.⁵⁶ According to AT&T, because AFC systems deployed in Canada will have to meet these requirements, requiring the same measures in the United States should have trivial additional costs.⁵⁷ AT&T points to a number of ISED requirements which it claims the Commission should apply to AFC systems:

⁵⁵ OET has recently issued guidance on the certification of standard power devices. *Part 15 Subpart E U-NII 6 GHz General Guidance Bands 5, 6, 7, 8*, Federal Communications Commission, Office of Engineering and Technology, Laboratory Division, KDB 987594 D01v02 (Aug. 9, 2023) <https://apps.fcc.gov/oetcf/kdb/forms/FTSSearchResultPage.cfm?id=277034&switch=P>.

⁵⁶ AT&T Feb. 7, 2023 *Ex Parte* at 1.

⁵⁷ *Id.*

- Standard power device users should be required to register a point of contact responsible for resolving interference issues with the device, which the AFC operator shall disclose to the ISED upon request and to the microwave licensee, minus any personal information, for the purpose of investigating interference cases;⁵⁸
- AFC systems should retain detailed logs of standard power device registrations, which shall include references to the registered information of the associated standard-power device;⁵⁹
- The AFC operator should provide a method for querying the AFC systems for available frequencies and power levels at a particular location;⁶⁰
- ISED may impose different standards necessary to protect incumbent systems that the AFC systems will be required to comply with. Similar to this requirement AT&T requests that the Commission explicitly condition final AFC system approvals on a requirement that the AFC systems respond and incorporate Commission adjustments of their coordination method from time to time as needed.⁶¹

27. According to AT&T, adopting these requirements will provide substantial assistance to microwave incumbents and the Commission in resolving harmful interference caused by standard power devices.⁶² AT&T suggests that implementing these requirements need not delay standard power device deployment as the approval of AFC systems could proceed with the commitment that the updated AFC system capabilities would be available as soon as possible.

28. Apple, Broadcom et al view AT&T's request as improperly seeking reconsideration of decisions already made in the *6 GHz Report and Order*.⁶³ According to Apple, Broadcom, et al, neither the Communications Act nor the Commission's rules allow for the untimely filing of petitions for reconsideration based on the contrary decisions of a non-U.S. regulator. Apple, Broadcom, et al point to requirements for registering a point of contact for devices, retaining detailed logs, and providing a method of querying the AFC system for available frequencies and power levels as going beyond the requirements of the rules.⁶⁴ Apple, Broadcom et al. believe there is no need to condition approval of the AFC systems on the AFC operators responding to and incorporating Commission adjustments of their coordination methods as they are required to comply with enforcement instructions by the rules. Furthermore, Apple, Broadcom, et al. explain that to the extent AT&T suggests that the Commission might adjust AFC protection thresholds in the Commission rules, this would require notice-and-comment rulemaking and cannot be changed by OET through the AFC system approval process.⁶⁵

29. As an initial matter, OET has no information as to which AFC system applicants plan to apply to manage 6 GHz band spectrum access in Canada. However, OET believes it is possible that many of the 13 applicants may choose not to serve the Canadian market. Hence, OET cannot assume they all will implement these features to meet Canadian requirements and do not agree with AT&T's suggestion that the cost of complying with these requirements will be trivial.

⁵⁸ *Id.* at 2.

⁵⁹ *Id.* at 2.

⁶⁰ *Id.* at 2.

⁶¹ *Id.* at 3.

⁶² *Id.* at 4.

⁶³ Apple, Broadcom et al March 17, 2023 *Ex Parte* at 1.

⁶⁴ *Id.* at 2-3.

⁶⁵ *Id.* at 3.

30. OET is required to implement the rules for standard power devices and AFC systems as adopted by the Commission. Several of AT&T's suggestions go beyond the Commission's rules, and therefore, OET cannot adopt them regardless of their merit. This is true of AT&T's request that standard power device registrations include providing a point of contact, which would go beyond the information that the rules specify be provided for device registration.⁶⁶ There is also no requirement that AFC operators provide a method to query the AFC systems for available frequencies and power levels at a particular location other than during the testing and approval process.⁶⁷ While the rules do require AFC systems to store registered information, this will only be the information that the standard power devices are required to provide during registration and not the additional information ISSED is requiring.⁶⁸ As to AT&T's request that AFC systems respond to and incorporate adjustments to the coordination method from time to time as needed, Apple, Broadcom et al. are correct that notice-and-comment rulemaking is required to change any parameters or requirements in the Commission's rules. However, OET does note that the rules require that the AFC systems establish and follow protocols to comply with enforcement instructions from the Commission.⁶⁹ To the extent that it is necessary to resolve instances of harmful interference that may arise, these enforcement instructions could require adjustments to the AFC systems' operations.

31. *Propagation Model Parameters*: In the *2022 Public Notice*, OET addressed the reliability and confidence levels used in the propagation models employed by the AFC systems.⁷⁰ OET noted that industry had not reached an agreement on these propagation model parameters.⁷¹ While OET did not specify particular values to use for these parameters, it did indicate that using 50% for the reliability and confidence levels in the ITM model and 50% for the confidence level in the WINNER II model and clutter models are lower bounds on these parameters that are consistent with the *6 GHz Report and Order*.⁷² OET indicated that these lower bounds represent the minimum protection level that must be provided to incumbent microwave stations, but emphasized that AFC systems may use more stringent levels (*i.e.*, predict additional standard-power device path loss by using higher reliability and confidence levels in the propagation models).

32. A group of commenters representing incumbents and one AFC system applicant note that industry reached a consensus on these propagation model parameters shortly before release of the *2022 Public Notice*.⁷³ The agreed upon parameters are significantly more conservative than the 50% levels specified as a bound by OET.⁷⁴ These commenters seek clarification that the *2022 Public Notice* should not be interpreted to override the industry consensus standards which are now specified in the WinnForum functional requirements document.⁷⁵ AT&T also points out that ISSED has included these

⁶⁶ *6 GHz Report and Order*, 35 FCC Rcd at 3883, para. 83; 47 CFR § 15.407(k)(8)(ii).

⁶⁷ *6 GHz Report and Order*, 35 FCC Rcd at 3871, para. 49 (“Applicants that receive a conditional approval will then be required to provide a test system that will be subject to a public trial period to provide interested parties an opportunity to check that it provides accurate results.”).

⁶⁸ *6 GHz Report and Order*, 35 FCC Rcd at 3884 para. 86; 47 CFR § 15.407(k)(5).

⁶⁹ 47 CFR § 15.407(k)(15)(vi).

⁷⁰ *2022 Public Notice* at 15-18, paras. 33-38.

⁷¹ *Id.* at 17, para. 38.

⁷² *Id.* at 18, para. 38.

⁷³ APCO International, AT&T Services, Comsearch, Edison Electric Institute, Enterprise Wireless Alliance, Fixed Wireless Communications Coalition, Utilities Technology Council, Verizon Jan. 27, 2023 *Ex Parte*.

⁷⁴ *Id.* at 2.

⁷⁵ *Id.* at 2 (citing *Functional Requirements for the U.S. 6 GHz Band under the Control of an AFC System*, WINNF-TS-1014, WinnForum, 44, 45, Table 6 (Oct. 31, 2022)).

industry consensus parameters in its specification document for AFC systems, which it claims underscores that the Commission should clarify that the *2022 Public Notice* does not override the industry consensus on these parameters.⁷⁶

33. According to Apple, Broadcom et al, OET was not overriding WinnForum or any other industry body by establishing minimum values for the propagation parameters in the *2022 Public Notice*.⁷⁷ Rather, they state that OET made clear that it believes in the value of industry consensus on this matter and that AFC operators have the option of adopting such levels on their own initiative. Apple, Broadcom et al claim there is nothing left for OET to clarify on this matter and that AT&T is attempting to seek untimely reconsideration of a settled issue.

34. OET fails to see how our statements in the *2022 Public Notice* can be interpreted as overriding the industry consensus on the propagation model parameters. While the *2022 Public Notice* did state that using the median values for the reliability and confidence levels are consistent with the *6 GHz Report and Order* and are sufficient to ensure that fixed service microwave links are adequately protected from receiving harmful interference, OET also emphasized that AFC systems may use parameters that provide more stringent levels of interference protection.⁷⁸ As the industry consensus parameters do in fact provide a higher degree of interference protection to incumbent licensees, AFC systems operating with these parameters would be operating consistently with our statements in the *2022 Public Notice*.

35. *Interference Reporting*: Many of the AFC system applicants have indicated an intention to collaborate with industry groups to formulate procedures for acting on reports of potential harmful interference.⁷⁹ OET strongly encourages the AFC system operators to work together to develop a process for addressing such reports. At a minimum, OET suggests that the AFC operators provide a means for 6 GHz licensed incumbents to report harmful interference. This could take the form of an email address where interference reports could be sent or an Internet portal that collects information on interference events.⁸⁰ This information could then be shared with all the AFC system operators and Commission Enforcement Bureau staff.

V. APPROVAL OF AFC SYSTEMS

36. After a conditionally approved AFC system operator submits reports describing their AFC system lab testing and public trial in ET Docket No. 31-352, they will be thoroughly examined by OET staff. OET will not approve an AFC system for full commercial operation until all valid issues, if any, revealed either by the lab testing or the public trial have been adequately addressed. OET staff may require the AFC applicant to provide supplemental information or conduct additional tests to ensure that OET staff have confidence that the AFC system functions as intended and provides interference protection to incumbent systems. If the reports and any additional requested information indicate that the

⁷⁶ AT&T Feb. 7, 2023 *Ex Parte* at 4.

⁷⁷ Apple, Broadcom et al March 17, 2023 *Ex Parte* at 4.

⁷⁸ *2022 Public Notice* at 18, para. 38.

⁷⁹ See e.g., Broadcom Feb. 24, 2022 *Ex Parte* ET Docket No. 21-352, at 3; Kyrio Feb. 25, 2022 *Ex Parte* ET Docket No. 21-352, at 3; Qualcomm Automated Frequency Coordination System Operator Application: Responses to Supplemental Questions, ET Docket No. 21-352, at 4 (filed Feb. 28, 2022); Supplement to Proposal from Sony Group Corporation to Serve as an Automated Frequency Coordination System Operator, ET Docket No. 21-352, at 4-5 (filed Feb. 24, 2022); Wi-Fi Alliance Feb. 22, 2022 *Ex Parte* ET Docket No. 21-352, at 6; Supplement to the Proposal by Federated Wireless to Serve as an Automated Frequency Coordination System Operator in the 6 GHz Band, ET Docket No. 21-352, at 9 (filed Feb. 9, 2022); Supplement to Comsearch Proposal to be Approved as an Automated Frequency Coordination Operator, ET Docket No. 31-352, at 9-10 (filed Mar. 1, 2022).

⁸⁰ One example of such an interference reporting mechanism is the webpage Federated Wireless has set up for reporting interference in the CBRS band. See <https://www.federatedwireless.com/report-cbrs-interference/>.

AFC system is in compliance with the Commission's rules governing AFC system operation, OET will issue a public notice approving the AFC system for commercial operation.

37. *Further Information.* Questions regarding this Public Notice may be directed to Nicholas Oros, Office of Engineering and Technology, at (202) 418-0636 or Nicholas.Oros@fcc.gov.

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