



# PUBLIC NOTICE

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**OET ANNOUNCES APPROVAL OF SEVEN 6 GHZ BAND AUTOMATED  
FREQUENCY COORDINATION SYSTEMS FOR COMMERCIAL OPERATION  
AND  
SEEKS COMMENT ON C3 SPECTRA'S PROPOSED AFC SYSTEM**

**ET Docket No. 21-352**

**Comments on C3Spectra's AFC Proposal Due By: March 15, 2024**

By the Chief, Office of Engineering and Technology:

## **I. INTRODUCTION**

1. The Office of Engineering and Technology (OET) hereby approves the applications to operate automated frequency coordination (AFC) systems submitted by Qualcomm Incorporated (Qualcomm), Federated Wireless, Inc. (Federated Wireless), Sony Group Corporation (Sony), Comsearch, a CommScope Company (Comsearch), the Wi-Fi Alliance Services Corporation (Wi-Fi Alliance),<sup>1</sup> the Wireless Broadband Alliance, Inc. (Wireless Broadband Alliance), and Broadcom Inc (Broadcom), subject to the conditions set forth herein. These seven AFC systems have undergone a rigorous testing program, as directed by OET, which included both lab testing and a public trial. The results from this testing indicate that these seven AFC systems operate in conformance with the Commission's 6 GHz band (5.925-7.125 GHz) unlicensed rules, which are designed to prevent harmful interference from standard power access devices and fixed client devices to licensed microwave receivers and certain radio astronomy observatories in the 6 GHz band. These seven AFC systems are now permitted to manage access to spectrum in the U-NII-5 (5.925-6.425 GHz) and U-NII-7 (6.525-6.875 GHz) portions of the 6 GHz band for standard power access points and fixed client devices in accordance with the Commission's rules. This action will permit standard power and fixed client devices to deploy and further expand spectrum access to provide new applications and services to American consumers and businesses. We also seek comment on C3Spectra's proposal, filed subsequent to the initial wave of AFC proposals received by the Commission, to become an approved AFC system operator.<sup>2</sup>

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<sup>1</sup> Subsequent to submitting its proposal to become an AFC system operator, the Wi-Fi Alliance created a wholly owned subsidiary – Wi-Fi Alliance Services Corporation – to act as the AFC system operator. *See* Letter from Alex Roytblat, Vice President, Worldwide Regulatory Affairs, Wi-Fi Alliance, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 21-352, at 1 (filed Dec. 11, 2023). Control of the Wi-Fi Alliance Services Corporation remains with Wi-Fi Alliance. *Id.*

<sup>2</sup> Proposal by C3Spectra Inc. for Approval of 6 GHz Automated Frequency Coordination Service Operator, ET Docket No. 21-352 (filed Dec. 3, 2023), <https://www.fcc.gov/ecfs/document/120222669592/1>.

## 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 available for expanded unlicensed operations.<sup>3</sup> The *6 GHz Report and Order* adopted rules for two different types of unlicensed operations—standard-power operations and low-power indoor operations.<sup>4</sup> Standard-power access points and fixed client devices are required to 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).<sup>5</sup> The U-NII-5 and U-NII-7 bands are also used by licensed fixed and temporary-fixed point-to-point microwave systems.<sup>6</sup> In addition, the 6.65-6.6752 GHz portion of the U-NII-7 band is used for radio astronomy observations at a limited number of observatories.<sup>7</sup> The AFC systems will manage spectrum access for standard-power access points and fixed client devices to prevent harmful interference from occurring to fixed microwave systems and certain radio astronomy observatories.<sup>8</sup>

3. On September 28, 2021, the Commission issued a Public Notice requesting proposals from prospective AFC system operators.<sup>9</sup> In response to the Public Notice, the Commission received fourteen applications to operate AFC systems, as well as eight comments regarding the applications.<sup>10</sup> One applicant, Amdocs, later withdrew its application.<sup>11</sup> 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, Kyrio, Key Bridge Wireless, Nokia Innovations, Federated Wireless, Wireless Broadband Alliance, Wi-Fi Alliance, Qualcomm, Plume Design, and RED Technologies.<sup>12</sup> OET indicated in the *2022 Public Notice* that these conditionally approved AFC systems will not be available for commercial operations until they receive final approval from OET.<sup>13</sup>

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<sup>3</sup> *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*).

<sup>4</sup> *Id.* at 3860, paras. 17-18.

<sup>5</sup> 47 CFR §§ 15.403, 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.” *Id.* § 15.403.

<sup>6</sup> *6 GHz Report and Order*, 35 FCC Rcd at 3855, para. 7.

<sup>7</sup> *Id.* at 3884, para. 87.

<sup>8</sup> 47 CFR § 15.407(l), (m); *6 GHz Report and Order*, 35 FCC Rcd at 3862, para. 22.

<sup>9</sup> *The Commission Begins the Process for Authorizing 6 GHz Band Automated Frequency Coordination Systems*, ET Docket No. 21-352, Public Notice, 36 FCC Rcd 14098, 14098, 14101-02, 14103, paras. 2, 7, 10 (2021).

<sup>10</sup> 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.

<sup>11</sup> Letter from Robert A. Silverman, Counsel to Amdocs, Inc., to Marlene H. Dortch, Secretary, FCC, ET Docket No. 21-352, at 1 (filed Mar. 25, 2022).

<sup>12</sup> *OET Announces Conditional Approval for 6 GHz Band Automated Frequency Coordination Systems*, ET Docket 21-352, Public Notice, 37 FCC Rcd 13071, 13071, para. 1 (OET 2022) (*2022 Public Notice*).

<sup>13</sup> *Id.* at 13073-74, para. 5.

4. On August 24, 2023, OET issued a Public Notice (*2023 Public Notice*) announcing that the conditionally approved AFC systems could commence testing and outlining the testing process.<sup>14</sup> This AFC system testing process consists of two parts, lab testing and a public trial, which the AFC systems must successfully complete before OET will approve them for commercial operation.<sup>15</sup> OET permits the lab test to be conducted either by an FCC-recognized accredited testing laboratory that has also been approved through the Wireless Innovation Forum's (WInnForum) Citizens Broadband Radio Service Device (CBSD) testing and certification program or by a test lab that has been accredited by WInnForum to conduct AFC system lab testing.<sup>16</sup> The test lab must conduct the tests specified in the AFC system test plan developed by the Wi-Fi Alliance.<sup>17</sup> In conducting these tests, the test lab is required to use a set of test vector inputs and corresponding test vector outputs jointly developed by the Wi-Fi Alliance and the WInnForum.<sup>18</sup> The AFC applicant is required to submit a test report created by the test lab describing the results of each test performed.<sup>19</sup>

5. For the public trial, the AFC system applicant is required to make its AFC system available on the Internet to provide any interested member of the public an opportunity to test the AFC system functionality.<sup>20</sup> The Internet-based test portal must permit the user to specify test locations anywhere within the United States and 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.<sup>21</sup> The 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.<sup>22</sup> The Internet-based test portal must be available for a minimum of forty-five days with challenges accepted for fifteen days after the forty-five day period concludes.<sup>23</sup> After the public trial is complete, the AFC applicant is required to submit a public trial report describing the public trial, including statistics on the number of public tests conducted, a summary of each challenge received, and an explanation detailing why each challenge did or did not raise a valid concern with the functionality of the AFC system, along with a description of any actions it took in response to any challenges.<sup>24</sup>

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<sup>14</sup> *OET Announces Commencement of Testing of the 6 GHz Band Automated Frequency Coordination Systems*, ET Docket 21-352, Public Notice, DA 23-759 (OET Aug. 24, 2023) <https://www.fcc.gov/edocs/search-results?t=advanced&daNo=23-759> (2023 Public Notice).

<sup>15</sup> *Id.* at 1, 3-7, 12-13, paras. 1, 6-18, 36; *see also* *6 GHz Report and Order*, 35 FCC Rcd at 3871, para. 49; *2022 Public Notice*, 37 FCC Rcd at 13090-92, paras. 41-47.

<sup>16</sup> *2023 Public Notice* at 5-6, paras. 11-12. A list of FCC recognized accredited testing laboratories can be found at <https://apps.fcc.gov/oetcf/eas/reports/TestFirmSearch.cfm>. A list of WInnForum-approved CBSD test labs can be found at <https://cbrs.wirelessinnovation.org/cbsd-certification-program>. The WInnForum accreditation process can be found at *Wireless Innovation Forum Authorized AFC System Test Lab Requirements*, Version 1.0.0, Aug. 4, 2022, <https://6ghz.wirelessinnovation.org/assets/WINNF-TS-5009-V1.0.0%206%20GHZ%20AFC%20System%20ATL%20Requirements%20Specification.pdf>.

<sup>17</sup> *2023 Public Notice* at 3-4, paras. 7-8; *see* *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>.

<sup>18</sup> *2023 Public Notice* at 4-5, paras. 8-9; *see* *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>.

<sup>19</sup> *2023 Public Notice* at 5, para. 9.

<sup>20</sup> *Id.* at 6, para. 13.

<sup>21</sup> *Id.* at 6, para. 14.

<sup>22</sup> *Id.* at 6, para. 15.

<sup>23</sup> *Id.* at 7, para. 17.

<sup>24</sup> *Id.* at 7, para. 18.

### III. LAB TESTING

6. Qualcomm, Federated Wireless, Sony, Comsearch, the Wi-Fi Alliance, the Wireless Broadband Alliance, and Broadcom submitted test reports summarizing their lab test results.<sup>25</sup> As required by the *2023 Public Notice*, all of the lab tests were conducted by FCC-recognized accredited testing laboratories that have also been approved by WInnForum's CBSD testing and certification program.<sup>26</sup> The test reports indicate that the testing laboratories conducted all the tests specified in the AFC system test plan developed by the Wi-Fi Alliance using the test vector inputs jointly developed by the Wi-Fi Alliance and WInnForum. All seven AFC systems returned expected outputs for the test vector inputs. Based on the submitted test reports, we conclude that those seven AFC systems satisfactorily completed the required lab testing. This testing provides strong evidence that these seven AFC systems function as required by the Commission's rules.

### IV. PUBLIC TRIALS

7. Qualcomm, Federated Wireless, Sony, Comsearch, the Wi-Fi Alliance, the Wireless Broadband Alliance, and Broadcom submitted public trial reports summarizing their public trials.<sup>27</sup> The table below summarizes the start and end dates that each AFC system was made available for the public trial, the number of inquiries each AFC applicant received during the public trial, and the number of challenges received by each AFC applicant.

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<sup>25</sup> Test and Certification for Qualcomm's AFC System using WInnForum Test Harness, ET Docket No. 21-352 (filed Oct. 4, 2023); Broadcom AFC SUT Test Report, ET Docket No. 21-352 (filed Oct. 3, 2023); Wi-Fi Alliance AFC SUT Test Report, ET Docket No. 21-352 (filed Oct. 5, 2023); Wireless Broadband Alliance AFC SUT Test Report, ET Docket No. 21-352 (filed Dec. 13, 2023); Test and Certification for Sony Group Corporation's AFC System using WInnForum Test Harness, ET Docket No. 21-352 (filed Nov. 6, 2023); Test and Certification for Federated Wireless's AFC System using WInnForum Test Harness, ET Docket No. 21-352 (filed Oct. 5, 2023) Comsearch AFC System (SUT) Test Report, ET Docket No. 21-352 (filed Oct. 9, 2023).

<sup>26</sup> See *2023 Public Notice* at 5, para. 11.

<sup>27</sup> Public Testing Report of Qualcomm US Automated Frequency Coordination System, ET Docket No. 21-352 (filed Dec. 7, 2023) (*Qualcomm Public Trial Report*); Broadcom Report on Successful AFC System Public Trial, ET Docket No. 21-352 (filed Dec. 6, 2023) (*Broadcom Public Trial Report*); Report on Public Trial of the Wi-Fi Alliance Automatic Frequency Coordination System, ET Docket No. 21-352 (filed Dec. 8, 2023) (*Wi-Fi Alliance Public Trial Report*); Wireless Broadband Alliance Inc. Report on Public Trial of the AFC System, ET Docket No. 21-352 (filed Dec. 15, 2023) (*WBA Public Trial Report*); Sony Group Corporation Automated Frequency Coordination System Public Trial Report, ET Docket No. 21-352 (filed Dec. 22, 2023) (*Sony Public Trial Report*); Federated Wireless, Inc. Automated Frequency Coordination System Public Trial Report, ET Docket No. 21-352 (filed Dec. 7, 2023) (*Federated Public Trial Report*); AFC Public Trial Final Report, Comsearch, ET Docket No. 21-352 (filed Dec. 13, 2023) (*Comsearch Public Trial Report*).

### AFC System Public Trials

Applicant	Start Date	End Date	Test Locations Submitted <sup>28</sup>	Challenges Received <sup>29</sup>
Qualcomm	9/6/23	10/20/23	510	90
Broadcom	9/5/23	10/19/23	686	93
Wi-Fi Alliance	9/6/23	10/21/23	686	156
Wireless Broadband Alliance	10/10/23	11/24/23	751	112
Sony	9/11/23	10/26/23	691	120
Federated Wireless	9/7/23	10/22/23	730	96
Comsearch	9/8/23	10/23/23	686	117

8. Over 500 test locations were submitted to each AFC public portal, which illustrates that the public rigorously vetted each AFC system’s capabilities. The vast majority of these inquiries did not result in a challenge being submitted to the AFC applicant. All seven AFC applicants received challenges from AT&T and the Electric Power Research Institute (EPRI). In addition, several AFC applicants also received challenges from FirstEnergy Corp. In their public trial reports, the AFC applicants described that there were reasonable explanations for the challenged results, that the challenges would require modification of the Commission’s rules governing AFC systems, or, in a small number of cases, that minor adjustments were needed to the AFC systems. As described in more detail below, we find that the public trial reports provided adequate explanations regarding the challenges received and satisfactory actions were taken, where appropriate, to modify the AFC systems. Therefore, we conclude that the seven AFC applicants satisfactorily completed the public trial process. The public trials provide strong evidence that these seven AFC systems function as specified in the Commission’s rules.

#### A. AT&T Challenges

9. AT&T submitted challenges to each of the seven AFC applicants during the public trials. AT&T indicates that it spent a significant amount of time working with the AFC applicants to identify the precise causes of the differences between the results calculated by the AFC systems and the results

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<sup>28</sup> Each AFC public portal was designed such that users could submit test parameters for any location in the United States and receive a list detailing the maximum power level for each frequency across the band at which a standard power device at that location could operate to insure that all incumbent operations, such as fixed service microwave links, are protected from harmful interference as proscribed by the Commission. The column labelled “Test Locations Submitted” depicts the total number of user submitted test locations received by each AFC public portal. The column labelled “Challenges Received” represents the subset of test locations submitted for which users notified the AFC public portal operator that they disagreed with the provided test result.

<sup>29</sup> While the AFC applicants indicated in their public trial reports the number of challenges received from AT&T and FirstEnergy, with the exception of Federated Wireless and Qualcomm they didn’t provide in their public trial reports the number of test locations for which they received challenges from the Electric Power Research Institute (EPRI). However, EPRI made a filing containing the communication sent to each AFC applicant which included a table listing the test locations submitted. This enabled OET to count the number of test location for which EPRI challenged the AFC system results. Letter from Katie Jereza, Vice President of Corporate Affairs, EPRI, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 21-352 at 1 (filed Jan. 18, 2024).

calculated by AT&T.<sup>30</sup> According to AT&T, these efforts, in some cases, resulted in changes to AT&T's own calculations or in modifications to some of the AFC systems.<sup>31</sup> AT&T observed that this process illustrated that reasonable engineers can differ with respect to how propagation calculations are implemented.<sup>32</sup> While AT&T indicates that it does not believe that the public trial results warrant deferring action on the AFC applications, it does request that AFC system approval be conditioned to ensure continued compliance with inter-industry agreements and on good faith efforts by the AFC system operators to work within inter-industry organizations, such as WinnForum that include both radio local area network (RLAN) and Fixed Service (FS) interest groups, to collaborate on issues affecting AFC system calculations.<sup>33</sup> AT&T also requests that the Commission condition AFC system approvals on a requirement to seek prior approval for any future modifications to AFC system calculations that are not subject to inter-industry agreement through an organization like WinnForum.<sup>34</sup> AT&T requests that the AFC system operators be required to provide notice in this docket of any future changes to their AFC systems that are not subject to cross-industry consensus and that the changes should be subject to Commission review, including potentially requiring a new public trial period.<sup>35</sup>

10. We appreciate the significant effort AT&T made in working with the AFC applicants to understand the public trial results. The public trial reports indicate that AT&T and the AFC applicants satisfactorily resolved all of AT&T's challenges. As the public trial reports indicate, some of these challenges resulted in AFC applicants modifying their AFC systems. These modifications appear to be straightforward, such as not permitting standard power devices to operate in off-shore locations<sup>36</sup> or outside the boundaries of the United States<sup>37</sup> or adjusting the methodology used to determine the height to use in calculations involving passive microwave reflectors.<sup>38</sup> Given the nature of these AFC system modifications and the assertions that the AFC applicants corrected these underlying issues, we find that additional testing is not needed regarding these issues.

11. For other challenges, as AT&T notes, the explanations illustrate that reasonable engineers can reach different conclusions on many details of how the propagation models are implemented. For example, the AFC applicants used a National Land Clutter Database (NLCD) that has been reformatted to match the latitude/longitude grid spacing used by their AFC systems, while AT&T used the unmodified NLCD data.<sup>39</sup> This can result in a different land clutter category (urban, suburban, rural, barren) being used in the propagation models if the reformatting causes the test location to be classified in a different clutter category. Other differences were caused by using a different set of evaluation points for the

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<sup>30</sup> Letter from Michael P. Goggin, AT&T Services, Inc., to Marlene H. Dortch, Secretary, FCC, ET Docket No. 21-352, at 2 (filed Dec. 25, 2023).

<sup>31</sup> *Id.*

<sup>32</sup> *Id.*

<sup>33</sup> *Id.* at 1, 2; AT&T states that neither the Wi-Fi Alliance nor the Open AFC group are neutral forums. *Id.* at 2. AT&T also requests that AFC system authority be conditioned on requiring "some unresolved matters to be addressed within those inter-industry organizations." *Id.* at 1. Given that AT&T is not specific as to which unresolved matters should be included within this requirement and our inability to control the agenda of inter-industry organizations, we are not adopting this suggested requirement.

<sup>34</sup> *Id.* at 2.

<sup>35</sup> *Id.* at 3.

<sup>36</sup> *Qualcomm Public Trial Report* at 10; *Sony Public Trial Report* at 14-15; Letter from Naotaka Sato, Sony Group Corporation, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 21-352, at 1 (filed Feb. 5, 2024).

<sup>37</sup> *Federated Public Trial Report* at 4.

<sup>38</sup> *WBA Public Trial Report* at 9-10.

<sup>39</sup> *E.g.*, *Sony Public Trial Report* at 16-17; *Broadcom Public Trial Report* at 5; *Federated Public Trial Report* at 8.

Irregular Terrain Model (ITM) propagation model,<sup>40</sup> using a different set of evaluation points for the uncertainty region around the test points,<sup>41</sup> ignoring all microwave receivers more than 200 kilometers away from the test point,<sup>42</sup> and replacing microwave receiver heights that are negative in the ULS database with a height of 1.5 meters.<sup>43</sup> The assumptions made by both AT&T and AFC applicants for all these cases appear to be reasonable. For this reason, we agree with AT&T that these implementation differences do not provide grounds for delaying approval of the AFC systems. In addition, we find that calculating available spectrum and permissible maximum power levels based on these differences does not result in any appreciable difference in the potential for unlicensed devices to cause harmful interference to incumbent systems.

12. We agree with AT&T that it would be useful for inter-industry organizations to develop standardized implementations for the propagation models to enable the AFC systems to provide more consistent results in all cases. We encourage inter-industry organizations that contain representatives from both the AFC system operators and microwave licensees, such as the WINNForum, to further study these implementation issues and any other issues that may be identified in the future to develop recommendations that can be used by the AFC systems in the future. AT&T suggests that as a condition of AFC system approval, we require AFC system operators to continue to work within inter-industry group(s) on AFC system implementation issues that affect the AFC system calculations. While we do not go as far as AT&T requests, we will continue to monitor developments in the band that could affect system calculations and could require system changes if warranted.<sup>44</sup>

13. We also appreciate the concern of AT&T that any future changes to any AFC system be subject to Commission review to the extent they are not subject to inter-industry agreement through an organization like WINNForum. While the lab testing and public trials give us confidence that the seven AFC systems are operating in conformance with the Commission's rules, if the AFC system software is modified this may no longer be the case. Therefore, as a condition of AFC system approval, we will require each AFC operator to (1) file a notice in ET Docket No. 21-352 informing OET and the public of any modification to its AFC system that can change the available frequency ranges and maximum power levels determined by its AFC system; and (2) receive OET approval prior to implementing any proposed modification. Depending on the significance and complexity of the modification, OET may require some form of testing or verification. We do not exempt AFC system modifications that may result from inter-industry agreements from this notification and approval requirement as AT&T suggests. As we previously noted, OET has the responsibility to administer the AFC systems and ensure that their operations are consistent with the Commission's rules to prevent harmful interference from occurring to licensees.<sup>45</sup> This responsibility cannot be delegated to inter-industry organizations.<sup>46</sup> Imposing this

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<sup>40</sup> *E.g.*, *Federated Public Trial Report* at 6-7; *Qualcomm Public Trial Report* at 11-12.

<sup>41</sup> *E.g.*, *WBA Public Trial Report* at 9; *Wi-Fi Alliance Public Trial Report* at 10.

<sup>42</sup> *E.g.*, *Broadcom Public Trial Report* at 6-7; *Wi-Fi Alliance Public Trial Report* at 10.

<sup>43</sup> *E.g.*, *Broadcom Public Trial Report* at 7; *Wi-Fi Alliance Public Trial Report* at 10.

<sup>44</sup> 47 CFR §0.241(k). The Office of Engineering and Technology has delegated authority to, among other things, "... develop procedures that these AFC system operators will use to ensure compliance with the requirements for AFC system operations; to make determinations regarding the continued acceptability of individual AFC system operators; ..." In exercising this delegated authority, OET could require AFC systems to make certain modifications if warranted based on the work of inter-industry groups or any other source.

<sup>45</sup> *2022 Public Notice*, 37 FCC Rcd at 13087, para. 37.

<sup>46</sup> We appreciate the work of WINNForum in developing technical standards for the AFC systems. In considering proposed modifications to AFC system operations, we will give great weight to inter-industry consensus reached in organizations such as the WINNForum.

notification and approval requirement on the AFC operators is consistent with the Commission's delegation of authority to OET to administer the AFC systems and AFC system operator functions.<sup>47</sup>

## B. EPRI

14. EPRI submitted test points to each of the AFC public portals that were located directly along the centerline of the main beam of a microwave antenna and that also have line of sight to the microwave antenna.<sup>48</sup> EPRI then compared the responses from the AFC systems with a free space path loss calculation.<sup>49</sup> While EPRI acknowledges that the Commission's rules specify the use of a different path loss model for distances greater than 30 meters, EPRI claims that using a propagation model other than free space will result in under-protection of microwave receivers because, according to EPRI, there is an unobstructed line-of-sight between the test location and microwave receiver.<sup>50</sup> EPRI also points out that additive interference from multiple standard power devices can combine to create harmful interference in excess of the -6 dB I/N interference protection criteria used by the AFC systems based on experimental results obtained from real-world testing performed by FirstEnergy.<sup>51</sup> EPRI also points out that there is a step discontinuity of approximately 20 dB in the AFC operator responses at a 1 kilometer distance, which implies that the ITM propagation model used at distances beyond 1 kilometer severely under-protects microwave receivers.<sup>52</sup> To resolve the step discontinuity and mitigate the challenges for line-of-sight cases and additive interference, EPRI suggests that the AFC systems use free space path loss in a 30 meter radius around the microwave receiver extending in a keyhole shape of size defined by the microwave antenna 3 dB beamwidth out to a distance of ten kilometers.<sup>53</sup> EPRI indicates that it intends to perform field tests to confirm the accuracy of its analysis of the public trial results and that it intends to engage with the WInnForum 6 GHz Committee to explore modifications to the AFC path loss models to reduce the possibility of harmful interference occurring.<sup>54</sup> The AFC applicants assert that their systems are using the propagation models specified by the Commission's rules and that aggregate interference calculations from multiple standard power access points is not required by the rules.<sup>55</sup>

15. The propagation models that AFC systems are required to use to model the potential for standard power access points and fixed client devices to cause harmful interference to fixed microwave services are specified in the Commission's rules. These rules specify that the free space path-loss model be used at distances up to 30 meters, the Wireless World Initiative New Radio phase II (WINNER II) model be used for distances more than 30 meters and up to and including 1 kilometer, and the ITM model with additional clutter loss be used at distances greater than 1 kilometer.<sup>56</sup> EPRI appears to be advocating that AFC systems modify their propagation models such that they would no longer comply with the Commission's rules rather than examining whether the AFC systems are operating properly within the Commission's rules. In adopting the rules governing AFC systems the Commission rejected applying the

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<sup>47</sup> 47 CFR § 0.241(k); *6 GHz Report and Order*, 35 FCC Rcd at 3870, para. 48.

<sup>48</sup> Letter from Katie Jereza, Vice President of Corporate Affairs, EPRI, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 21-352 at 1 (filed Jan. 18, 2024).

<sup>49</sup> *Id.*

<sup>50</sup> *Id.* at 2.

<sup>51</sup> *Id.*

<sup>52</sup> *Id.*

<sup>53</sup> *Id.* at 14, 25.

<sup>54</sup> *Id.* at 2.

<sup>55</sup> *Qualcomm Public Trial Report* at 8-9; *Broadcom Public Trial Report* at 3-4; *Wi-Fi Alliance Public Trial Report* at 12; *WBA Public Trial Report* at 2-4; *Sony Public Trial Report* at 21; *Federated Public Trial Report* at 4-6; *Comsearch Public Trial Report* at 16-36.

<sup>56</sup> 47 CFR § 15.407(l)(1); *6 GHz Report and Order*, 35 FCC Rcd at 3875-77, paras. 64-66.



free space model more broadly, noting that “it drastically underpredicts path loss for longer distances because, as a practical matter, there is almost always interaction with the environment that reduces the signal level below the free space level.”<sup>57</sup> The Commission also explicitly rejected requiring the AFC systems to take into account aggregate interference from multiple standard power access points when making calculations.<sup>58</sup> EPRI is essentially arguing that the rules be modified. However, any such changes must be done through Commission action in a rulemaking proceeding and is thus beyond the scope of the AFC system test process. Therefore, EPRI’s challenges provide no basis for concluding that these seven AFC systems do not comply with the Commission’s AFC rules.

### **C. First Energy**

16. FirstEnergy submitted challenges to six AFC systems undergoing public trials—all except for Qualcomm—for three test points.<sup>59</sup> FirstEnergy later withdrew their challenge to Federated Wireless’s results after discussion with Federated Wireless.<sup>60</sup> According to the other AFC applicants, for these three points, FirstEnergy used “pathloss 6 software” which used the free space propagation model with an additional diffraction loss instead of the propagation model required by the Commission’s rules.<sup>61</sup> Several of the AFC applicants reported that FirstEnergy’s calculations also departed from the technical specification developed by WInnForum for the AFC system by using a different noise figure, antenna gain, and feeder loss for the microwave receiver.<sup>62</sup> As the public trial reports indicate that FirstEnergy used a propagation model that was not in agreement with Commission’s rules, we conclude that FirstEnergy’s challenges do not provide grounds to conclude that the AFC systems are operating incorrectly.

### **D. Other Modifications to AFC Systems**

17. Several AFC applicants report making modifications to their AFC systems on their own initiative or at the suggestion of OET staff. These changes include using a more current set of ULS data, correcting the areas used for protecting radio astronomy observatories, and correcting a misconfiguration issue that resulted in incorrect clutter data being used in some propagation models.<sup>63</sup> These are minor issues that the AFC applicants have corrected and we find that additional testing is not needed regarding these issues.

## **V. REPORTING OF POTENTIAL INTERFERENCE**

18. In the *2023 Public Notice*, OET noted that the AFC system applicants indicated their intent to collaborate with industry groups to formulate procedures for acting on reports of potential harmful interference.<sup>64</sup> OET strongly encouraged the AFC system operators to develop a process for addressing

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<sup>57</sup> *6 GHz Report and Order*, 35 FCC Rcd at 3877, para. 67.

<sup>58</sup> *6 GHz Report and Order*, 35 FCC Rcd at 3879, para. 72.

<sup>59</sup> *Broadcom Public Trial Report* at 2-3; *Wi-Fi Alliance Public Trial Report* at 12-13; *WBA Public Trial Report* at 2; *Sony Public Trial Report* at 21-22; *Federated Public Trial Report* at 3; *Comsearch Public Trial Report* at 14-16.

<sup>60</sup> *Federated Public Trial Report* at 3.

<sup>61</sup> *E.g.*, *WBA Public Trial Report* at 2; *Broadcom Public Trial Report* at 2; *Sony Public Trial Report* at 21.

<sup>62</sup> *Comsearch Public Trial Report* at 14-16; *Sony Public Trial Report* at 21; *Broadcom Public Trial Report* at 3.

<sup>63</sup> *Federated Public Trial Report* at 4; *Broadcom Public Trial Report* at 1, *Comsearch Public Trial Report* at 6.

<sup>64</sup> *2023 Public Notice* at 12, para. 35 (citing, 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*

(continued....)

such reports.<sup>65</sup> Qualcomm, Federated Wireless, Sony, Comsearch, the Wi-Fi Alliance, the Wireless Broadband Alliance, and Broadcom recently expressed their commitment “to establishing a centralized means to receive and address complaints regarding purported harmful interference from AFC-authorized unlicensed operations.”<sup>66</sup> These AFC system applicants indicate that they are working together “to create an efficient process that will ensure that complaints are handled in a timely and efficient manner” and that this process will be implemented within a reasonable time following final approval of their AFC systems.<sup>67</sup> OET appreciates that these AFC operators are willing to collaborate to create a process for receiving and addressing complaints of potential interference. We believe that it is important that such a process be developed and implemented, given the obligation that unlicensed devices not cause harmful interference to licensed operations.<sup>68</sup> To ensure that such a system is put in place, we condition the approval provided herein for these AFC systems to provide commercial operations on them putting in place such a process by April 23, 2024. These AFC operators will provide details of this reporting process by notifying the Commission and the public through a filing in ET Docket No. 21-352. These seven entities may commence commercial AFC operations at this time, but must cease such operations if this reporting mechanism is not noticed to the Commission and the public by April 23, 2024.

## VI. APPROVAL OF AFC SYSTEMS

19. As OET indicated in the *2023 Public Notice*, conditionally approved AFC systems are required to successfully complete both lab testing and a public trial to be approved for commercial operations.<sup>69</sup> This testing process was designed to verify that the AFC systems comply with the Commission’s rules. In the *6 GHz Report and Order*, the Commission concluded that the rules that require standard power and fixed client 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.<sup>70</sup> The test reports and public trial reports submitted by Qualcomm, Federated Wireless, Sony, Comsearch, the Wi-Fi Alliance, the Wireless Broadband Alliance, and Broadcom indicate that their AFC systems are operating in compliance with the Commission’s rules. We therefore approve these seven AFC systems for commercial operations, subject to the conditions set forth herein.

## VII. ADDITIONAL AFC SYSTEM APPLICATION

20. The Commission subsequent to the initial set of applications for AFC system operators received a proposal from C3Spectra to operate an AFC system.<sup>71</sup> Consistent with the process specified in the *6 GHz Report and Order*, the public will have an opportunity to review and comment on C3Spectra’s AFC proposal.<sup>72</sup> OET requests that any comments regarding C3Spectra’s AFC proposal be submitted in ET Docket No. 21-352 by March 15, 2024. OET will examine C3Spectra’s proposal along with any comments received and conditionally approve the proposal if it demonstrates that the proposed system

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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).

<sup>65</sup> *Id.*

<sup>66</sup> Letter from Christopher Szymanski, Broadcom Inc. et al., to Marlene H. Dortch, Secretary, FCC, ET Docket No. 21-352, at 1 (filed Jan. 29, 2024).

<sup>67</sup> *Id.*

<sup>68</sup> 47 CFR § 15.5(b).

<sup>69</sup> *2023 Public Notice* at 3, 7, paras. 6, 19; see *6 GHz Report and Order*, 35 FCC Rcd at 3871, para. 49.

<sup>70</sup> *6 GHz Report and Order*, 35 FCC Rcd at 3862, para. 22.

<sup>71</sup> Proposal by C3Spectra Inc. for Approval of 6 GHz Automated Frequency Coordination Service Operator, ET Docket No. 21-352 (filed Dec. 3, 2023), <https://www.fcc.gov/ecfs/document/120222669592/1>.

<sup>72</sup> *6 GHz Report and Order*, 35 FCC Rcd at 3871, para. 49.

would comply with all AFC requirements.<sup>73</sup> If C3Spectra's proposal is conditionally approved, it may then begin the testing process that OET specified in the *2023 Public Notice*.<sup>74</sup> Once testing is complete, OET will examine the C3Spectra's test report and public trial report to determine if its AFC system can be approved for commercial operations.

21. *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](mailto:Nicholas.Oros@fcc.gov).

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<sup>73</sup> *Id.*

<sup>74</sup> *2023 Public Notice* at 3-7, paras. 6-18; *see 6 GHz Report and Order*, 35 FCC Rcd at 3871, para. 49.