

**FCC FACT SHEET\***

**Unlicensed White Space Device Operations in the Television Bands**

Second Order on Reconsideration and Order, ET Docket Nos. 04-186 and 14-165

**Background:** Unlicensed white space devices deliver valuable wireless services, including broadband data to rural areas. Unlicensed white space devices operate in the broadcast TV bands and portions of the 600 MHz band, a spectral region that has excellent propagation characteristics particularly attractive for delivering wireless communications services over long distances, varying terrain, and into and within buildings. The Commission's Part 15 rules allow unlicensed white space devices to operate at locations where frequencies are not in use by licensed services or protected entities. Wireless Internet Service Providers use fixed white space devices to provide Internet connectivity to schools, libraries, and rural households. White space devices can help to close the digital divide while at the same time protecting broadcast television stations in the band from harmful interference.

In a Report and Order adopted in August 2015, the Commission adopted a requirement that white space databases, which determine the channels available for white space device use, must "push" changes in channel availability information to white space devices when a licensed wireless microphone registers to use a channel. Two parties requested that the Commission reconsider that requirement, which the Commission has waived since shortly before it was to have gone into effect. In addition, one party requested reconsideration of the Office of Engineering and Technology's 2018 designation of Nominet UK as a white space database administrator.

**What the *Second Order on Reconsideration* Would Do:**

- Revise the technical requirements for how white space devices and white space databases work together to ensure that licensed wireless microphone operations continue to be protected from harmful interference in a timely fashion.
- Specifically, it would –
  - Replace the requirement for white space databases to "push" changes in channel availability information to white space devices when a licensed wireless microphone user registers to use a previously available channel with a requirement for devices operating on TV channels to check the database more frequently to protect licensed wireless microphones -- once per hour rather than once per day.
- Require white space devices to comply with the faster re-check requirement beginning 6 months after the effective date of the rules.

**What the *Order* Would Do:**

- Deny the National Association of Broadcasters' petition for reconsideration of the Office of Engineering and Technology's 2018 approval of Nominet UK (now RED Technologies) as a white space database administrator.

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\* This document is being released as part of a "permit-but-disclose" proceeding. Any presentations or views on the subject expressed to the Commission or its staff, including by email, must be filed in ET Docket No. 14-165 (*Second Order on Reconsideration*) or ET Docket No. 04-186 (*Order*), which may be accessed via the Electronic Comment Filing System (<https://www.fcc.gov/ecfs/>). Before filing, participants should familiarize themselves with the Commission's ex parte rules, including the general prohibition on presentations (written and oral) on matters listed on the Sunshine Agenda, which is typically released a week prior to the Commission's meeting. See 47 CFR § 1.1200 et seq.

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of )
Amendment of Part 15 of the Commission’s Rules ) ET Docket No. 14-165
for Unlicensed Operations in the Television Bands, )
Repurposed 600 MHz Band, 600 MHz Guard )
Bands and Duplex Gap, and Channel 37 )
Expanding the Economic and Innovation ) GN Docket No. 12-268
Opportunities of Spectrum Through Incentive )
Auctions )
Unlicensed White Space Device Operations in the ) ET Docket No. 20-36
Television Bands )
Unlicensed Operation in the TV Broadcast Bands ) ET Docket No. 04-186

SECOND ORDER ON RECONSIDERATION AND ORDER\*

Adopted: []

Released: []

By the Commission:

TABLE OF CONTENTS

Heading Paragraph #
I. INTRODUCTION..... 1
II. BACKGROUND..... 2
III. ORDER ON RECONSIDERATION ..... 9
A. Background..... 10
B. Discussion..... 21
IV. ORDER ..... 35
V. PROCEDURAL MATTERS..... 43
A. Final Regulatory Flexibility Analysis..... 43

\* This document has been circulated for tentative consideration by the Commission at its January 2022 open meeting. The issues referenced in this document and the Commission’s ultimate resolution of those issues remain under consideration and subject to change. This document does not constitute any official action by the Commission. However, the Chairwoman has determined that, in the interest of promoting the public’s ability to understand the nature and scope of issues under consideration, the public interest would be served by making this document publicly available. The FCC’s ex parte rules apply and presentations are subject to “permit-but-disclose” ex parte rules. See, e.g., 47 CFR §§ 1.1206, 1.1200(a). Participants in this proceeding should familiarize themselves with the Commission’s ex parte rules, including the general prohibition on presentations (written and oral) on matters listed on the Sunshine Agenda, which is typically released a week prior to the Commission’s meeting. See 47 CFR §§ 1.1200(a), 1.1203.

B. Paperwork Reduction Act..... 44  
 C. Congressional Review Act..... 45  
 D. Contact Persons..... 46  
 VI. ORDERING CLAUSES..... 47  
 Appendix A – Final Rules  
 Appendix B – List of Parties Filing Petitions for Reconsideration of the Push Notification Requirement  
 Appendix C – Final Regulatory Flexibility Analysis

**I. INTRODUCTION**

1. As the Commission continues taking steps to sustain and spur growth of the white space ecosystem, we adopt two orders resolving pending issues associated with white space devices and the white spaces databases. The actions being taken today will provide additional certainty to white space device users, manufacturers and database administrators to enable unlicensed white space devices to operate efficiently and protect other spectrum users, in particular wireless microphone users. In the Second Order on Reconsideration, we address petitions for reconsideration of the requirement for white space databases to “push” channel availability changes to white space devices when a licensed wireless microphone operator registers in the white space database to use a TV channel. We remove the push notification requirement and replace it with a simpler rule that requires white space devices operating on broadcast TV channels to re-check the database more frequently. In the Order, we deny a petition for reconsideration of the Office of Engineering and Technology’s (OET’s) designation of Nominet UK (now RED Technologies) as a white space database administrator.<sup>1</sup>

**II. BACKGROUND**

2. In 2008, the Commission first authorized unlicensed white space device operations, both fixed and personal/portable, in portions of the VHF and UHF broadcast TV bands at locations where frequencies were not being used by TV broadcasters and associated services.<sup>2</sup> In 2010, 2012, and 2015, the Commission took steps to promote additional opportunities for unlicensed white space devices to use spectrum in the TV bands and to reflect changes in the TV bands resulting from the Incentive Auction.<sup>3</sup> Significantly, the Commission’s rules following the incentive auction, which repurposed a significant portion of the TV bands for 600 MHz wireless services, continued to authorize white space device operation on the unused channels of broadcast television spectrum (TV bands) and on channel 37, as well as permitting operation on the upper six-megahertz portion of the 600 MHz duplex gap (657-663 MHz), and on the 600 MHz service bands (617-652 MHz and 663-698 MHz) at locations where a Part 27 600

<sup>1</sup> Petitions requesting reconsideration of final actions taken pursuant to delegated authority are acted on by the designated authority or may be referred by such authority to the Commission. 47 CFR § 1.106(a)(1). In this case for the sake of efficiency, OET referred the petition to the Commission for action since we are already addressing other white space issues in this Order.

<sup>2</sup> *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 and 02-380, Second Report and Order and Memorandum Opinion and Order, 23 FCC Rcd 16807 (2008).

<sup>3</sup> *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 and 02-380, Second Memorandum Opinion and Order, 25 FCC Rcd 18661 (2010); *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 and 02-380, Third Memorandum Opinion and Order, 27 FCC Rcd 3692 (2012) (*White Spaces Third MO&O*); *Amendment of Part of the Commission’s Rules for Unlicensed Operations in the Television Bands, Repurposed 600 MHz Band, 600 MHz Guard Bands and Duplex Gap, and Channel 37; Amendment of Part 74 of the Commission’s Rules for Low Power Auxiliary Stations in the Repurposed 600 MHz Band and the 600 MHz Duplex Gap, Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, ET Docket No. 14-165 and GN Docket No. 12-268, 30 FCC Rcd 9551 (2015) (*White Spaces Order*).

MHz wireless service licensee has not commenced operations.<sup>4</sup> The Commission's current rules provide for three classes of white space devices: fixed, mobile, and personal/portable.<sup>5</sup> These rules provide white space devices' flexibility to provide a variety of wireless services, including broadband data. Fixed white space devices are also being deployed to provide backhaul services, often in rural and underserved communities, for Internet connectivity offered by Wireless Internet Service Providers (WISPs), schools and libraries.

3. To prevent harmful interference to broadcast television stations and other protected users<sup>6</sup> of the bands where they operate, white space devices obtain a list of available channels, including the maximum permissible power level on each channel, from databases administered by private entities designated by the Commission.<sup>7</sup> Fixed and mobile white space devices must incorporate a geo-location capability (to provide a single point for fixed devices or its location within a geo-fenced area for mobile devices) and a means to access a white space database.<sup>8</sup> Personal/portable white space devices can either acquire a list of available channels via another device (Mode I), or include geo-location and database access capabilities (Mode II) to obtain a list of available channels that may be used at their location.<sup>9</sup>

4. Under existing rules, fixed, mobile and Mode II personal/portable devices must contact a white space database at least once per day and must adjust their channel use in accordance with channel availability schedule information provided by the database for the 48-hour period beginning at the time the device last accessed the database.<sup>10</sup> If a white space device cannot contact a database on a given day, it may continue to operate until 11:59 PM the next day, after which time it must cease operation if it is still unable to contact a database.<sup>11</sup>

5. In its 2015 *White Spaces Report and Order*, the Commission modified the technical rules for white space device operations in the spectrum that continues to be TV band spectrum following the incentive auction. To provide greater flexibility for white space devices, it established the technical rules for white space devices that operate in a 6-megahertz portion of the newly created 600 MHz duplex gap and on channel 37, and it permitted white space devices to operate under modified technical rules in the 600 MHz service band at locations where a wireless licensee has not yet commenced operations.<sup>12</sup> In addition, the Commission adopted rules that allow wireless microphones to operate in the 600 MHz guard

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<sup>4</sup> *Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, Report and Order, 29 FCC Rcd 6567 (2014) (*Incentive Auction R&O*); *Unlicensed Operations in the Television Bands, Repurposed 600 MHz Band, 600 MHz Guard Bands and Duplex Gap, and Channel 37*, Report and Order, 30 FCC Rcd 9551 (2015) (*White Spaces Report and Order*); 47 CFR § 15.707.

<sup>5</sup> 47 CFR § 15.703.

<sup>6</sup> See 47 CFR § 15.712(a)-(k). White space devices must protect: (1) digital television stations, and digital Class A TV, low power TV, TV translator and TV booster stations; (2) certain TV translator, low power TV (including Class A) and Multi-channel Video Programming Distributor (MVPD) receive sites; (3) fixed Broadcast Auxiliary Service (BAS) links; (4) Private Land Mobile Radio Service and Commercial Mobile Radio Service (PLMRS/CMRS) operations; (5) Offshore Radiotelephone Service; (6) low power auxiliary services, including wireless microphones; (7) border areas near Canada and Mexico; (8) radio astronomy services; (9) 600 MHz band services; (10) Wireless Medical Telemetry Service (WMTS) on channel 37; and (11) 488-494 MHz band in Hawaii. *Id.*

<sup>7</sup> 47 CFR §§ 15.711(c)(2), (d)(2) and 15.715.

<sup>8</sup> 47 C.F.R. § 15.711(c)(1), (k)(2), (5).

<sup>9</sup> 47 CFR §§ 15.703(i) and 15.711(d-e). A Mode I device is not required to incorporate geo-location and database access capabilities.

<sup>10</sup> 47 CFR §§ 15.711(c)(2)(iii), (k)(9), (d)(4). Mode II personal/portable devices must also re-check the database if they move more than 100 meters. 47 CFR § 15.711(d)(2).

<sup>11</sup> 47 CFR § 15.711(h).

<sup>12</sup> See generally *White Spaces Report and Order*.

band and the 600 MHz duplex gap (where a 4-megahertz portion is reserved for licensed wireless microphone operations and the other 6-megahertz portion is available for unlicensed operations), and codified Part 15 rules to authorize unlicensed wireless microphone operations in those bands and the TV bands. The Commission also adopted rules that protect licensed wireless microphone operations registered to operate on available TV channels at particular times and locations by requiring white space databases to “push” changes in channel availability to white space devices when a licensed wireless microphone is registered on such TV channel(s) (“push notifications”).<sup>13</sup> The Commission provided white space database administrators 12 months after the effective date of the rules, until December 23, 2016, to comply with this new requirement.<sup>14</sup>

6. *Petitions for reconsideration of the push notification requirement.* While most of the issues raised in the petitions for reconsideration of the *White Spaces Report and Order* have previously been addressed,<sup>15</sup> two pending petitions sought reconsideration of the push notification rules.<sup>16</sup> Google expresses concern that the push notification requirement was overly burdensome on the database administrator and white space devices to the extent that they rely on battery power,<sup>17</sup> while NAB expresses concern that there is no assurance that white space devices will actually receive the notification.<sup>18</sup> In response, Microsoft contends that the push notification requirement is technically infeasible,<sup>19</sup> while Sennheiser and Shure agree with NAB that additional rules would be needed to ensure that white space devices actually receive the notifications.<sup>20</sup>

7. *Petition for reconsideration of designation of Nominet as a database administrator.* On September 19, 2018, OET approved Nominet UK to operate a white space database system.<sup>21</sup> NAB filed a petition for reconsideration of this action, arguing that Nominet’s database contains numerous errors and that Nominet should be de-certified as a database administrator until it corrects the errors.<sup>22</sup> Nominet

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<sup>13</sup> *White Spaces Report and Order*, 30 FCC Rcd at 9662-64, para. 273-78.

<sup>14</sup> *Id.* at 9662, para. 274; 47 CFR § 15.711(i)(3).

<sup>15</sup> All but two of the issues raised in the ten petitions for reconsideration have been addressed in earlier decisions. *Promoting Spectrum Access for Wireless Microphone Operations; Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, GN Docket Nos. 14-166, 12-268, Order on Reconsideration and Further Notice of Proposed Rulemaking, 32 FCC Rcd 6077 (2017) (*Wireless Microphones Order on Reconsideration*); *Amendment of Part 15 of the Commission’s Rules for Unlicensed White Space Devices; Amendment of Part 15 of the Commission’s Rules for Unlicensed Operations in the Television Bands, Repurposed 600 MHz Band, 600 MHz Guard Bands and Duplex Gap, and Channel 37; Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, ET Docket Nos. 16-56 and 14-165 and GN Docket No. 12-268, Report and Order and Order on Reconsideration, 34 FCC Rcd 1827 (2019) (*2019 White Spaces Order*). Aside from two pending petitions that seek reconsideration of the push requirement, the only other remaining issue—which is not addressed in this decision document—concerns the rules authorizing white space device use of channel 37.

<sup>16</sup> Google Petition at 1-11; NAB Push Notification Petition at 4-7.

<sup>17</sup> Google Petition at 1-11.

<sup>18</sup> NAB Push Notification Petition at 4-7.

<sup>19</sup> Microsoft Opposition at 16.

<sup>20</sup> Sennheiser Opposition at 8; Shure Opposition at 6. A list of parties filing petitions for reconsideration of the push notification rule, as well as parties responding to those petitions, is provided in Appendix C.

<sup>21</sup> Nominet Approval Letter, 33 FCC Rcd at 8794 (OET 2018).

<sup>22</sup> Petition for Reconsideration of the National Association of Broadcasters, ET Docket No. 04-186, at 4-6 (filed September 19, 2018) (NAB Designation Petition).

states that the errors were a result of difficulties in importing data from the Commission's new Licensing and Management System (LMS) and that it immediately corrected the import procedure.<sup>23</sup>

8. *Subsequent Commission actions on white space devices.* The Commission in the *2019 White Spaces Order* took steps to improve the accuracy and reliability of fixed white space device data in the white space databases and assure that the potential for these devices to cause interference to protected services is minimized.<sup>24</sup> It also increased the maximum permissible height above ground level for fixed device antennas in rural areas to allow improved broadband coverage.<sup>25</sup> The Commission made additional rule changes in the *2020 White Spaces Report and Order* that benefit users in rural areas by increasing the maximum allowable power and antenna height above average terrain for fixed devices, which can further improve broadband coverage in these areas.<sup>26</sup> Additionally, it established a new class of higher power mobile devices that can operate in rural areas as well as a new class of narrowband devices (both fixed and portable) intended to promote Internet of Things (IoT) applications that can operate in any area.<sup>27</sup>

### III. ORDER ON RECONSIDERATION

9. In this Order on Reconsideration, we address the pending petitions for reconsideration of the push notification rules. Based on the record before us, we eliminate the requirement for white space databases to push changes in channel availability to white space devices and instead require that these devices – including fixed and Mode II personal/portable white space devices (including narrowband IoT devices) and mobile white space devices – operating on TV channels to re-check the database on a more frequent basis than under the current rules.

#### A. Background

10. The existing rules prescribe communications between white space devices and a white space database to provide interference protection to other spectrum users – both to authorized services and protected users generally and to licensed wireless microphone operations that are registered at particular times and locations in the database. To provide general protection to authorized services (e.g., primary and secondary broadcast television users in the TV bands, wireless service providers in the 600 MHz service band) and protected users (e.g., TV translator receive sites and Multiple Video Program Distributor (MVPD) receive sites), white space devices must re-check the database at least once per day to obtain the list of available channels at the location where the device operates.<sup>28</sup> The Commission established these timeframes because most protected services listed in its databases do not change on a frequent basis, and because the Commission provides updated data to the white space database administrators only once every weekday.<sup>29</sup> To protect licensed wireless microphones operating in the TV bands that are registered in the white spaces database, the Commission requires more frequent communications in the event of microphone usage registrations that need more timely protection. In the

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<sup>23</sup> Reply of Nominet to the Petition for Reconsideration of the National Association of Broadcasters, ET Docket No. 04-186, at 2 (filed November 14, 2018).

<sup>24</sup> *2019 White Spaces Order*, 34 FCC Rcd at 1828, para. 2. These changes are described in more detail below.

<sup>25</sup> *Id.*

<sup>26</sup> *Unlicensed White Space Device Operations in the Television Bands*, Report and Order, 36 FCC Rcd at 12606, para. 7.

<sup>27</sup> *Id.*

<sup>28</sup> *White Spaces Report and Order*, 30 FCC Rcd at 9661, para. 270; 47 CFR § 15.711(c)(2)(iii), (d)(4). If a device is unable to make contact with the database on any given day, it may continue to operate until 11:59 PM on the following day, at which time it must cease operation until it re-establishes contact with the database. 47 CFR § 15.711(h).

<sup>29</sup> *White Spaces Report and Order*, 30 FCC Rcd at 9661, para. 271.

2015 *White Spaces Report and Order*, the Commission adopted the push notification requirement, which it believed to be an efficient way of achieving this objective.<sup>30</sup> Furthermore, because licensed microphone operations can be registered in any whitespace database, the Commission required that a white space database administrator share registration information with the other databases in a timely fashion.<sup>31</sup>

11. The Commission's decision to adopt the push notification requirement was intended to provide protection to licensed wireless microphone operations that may, upon registering to operate on specified TV channels, need quick protection from potential interference from white space device operations. Prior to adopting the *Incentive Auction R&O* in 2014, which required repurposing and auctioning some TV band spectrum for new 600 wireless service, the Commission had reserved two TV channels where white space devices were not permitted to operate to ensure that there would be spectrum available for wireless microphones used in applications such as electronic news gathering for which it is not possible to register the operating location in the database at least 24 hours in advance.<sup>32</sup> In the *Incentive Auction R&O*, the Commission decided to no longer designate two unused television channels for wireless microphones and instead took steps to improve the operation of the white space database to provide more immediate protection to wireless microphones.<sup>33</sup> To ensure that registered wireless microphone users continue to receive protection in a timely manner, the Commission then proposed in its 2014 *White Spaces NPRM* to: (1) require fixed and Mode II personal/portable white space devices to re-check the database at time intervals not to exceed 20 minutes, (2) eliminate the rule that allows a white space device to continue operating until 11:59 PM on the following day if it cannot establish contact with the database, and (3) require database administrators to share wireless microphone registration information between databases within ten minutes.<sup>34</sup>

12. In the *White Spaces Report and Order* adopted in August of 2015 the Commission sought to balance the concerns of white space device and wireless microphone proponents when it adopted the push notification requirement in place of the proposed 20-minute re-check requirement to meet its objectives.<sup>35</sup> The Commission was concerned that requiring all white space devices to re-check a database (regardless of their location) for a list of available channels every twenty minutes could unnecessarily burden the database administrators, adversely affect operation of white space devices relying on batteries for operation, and increase costs for white space device users.<sup>36</sup> To ensure that channels would continue to be available for wireless microphones used for events that cannot be anticipated, such as late-breaking news events, the Commission concluded at that time, as suggested by parties in the record, that a reasonable and workable approach to accomplishing its goals was to require that database administrators "push" information to white space devices only in areas where licensed wireless microphones will be used, rather than requiring all white space devices to re-check a database

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<sup>30</sup> *White Spaces Report and Order*, 30 FCC Rcd at 9662, para. 273.

<sup>31</sup> 47 CFR § 15.715(l). In the *White Spaces Report and Order*, the Commission required that in cases where a licensed wireless microphone user requests immediate access to a channel, the registration information must be shared with other database administrators within ten minutes. *White Spaces Report and Order*, 30 FCC Rcd at 9662, para. 274.

<sup>32</sup> *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 and 02-380, Second Memorandum Opinion and Order, 25 FCC Rcd 18661, 18715, para. 132 (2010).

<sup>33</sup> *Incentive Auction Report and Order*, 29 FCC Rcd at 6701-02, paras. 309-11.

<sup>34</sup> *White Spaces NPRM*, 29 FCC Rcd at 12306, para. 190.

<sup>35</sup> We note that one party commenting on the *White Spaces NPRM*, WISPA, had proposed that the Commission adopt a push requirement, which under the then-existing rules had been permitted as an option. WISPA Comments at 21-22.

<sup>36</sup> *White Spaces Report and Order*, 30 FCC Rcd at 9663, para. 277.

every twenty minutes.<sup>37</sup> Under this approach, when a database administrator receives a registration request for immediate access to particular channels for licensed wireless microphone use, the database administrators would, within ten minutes, share the licensed wireless microphone's channel registration information among themselves and within 20 minutes of receiving that information, would "push" information about changes in channel availability to fixed and Mode II personal/portable white space devices.<sup>38</sup> The Commission provided white space database administrators 12 months after the effective date of the rules, until December 23, 2016, to comply with this new requirement.<sup>39</sup>

13. *Petitions for reconsideration.* Google and NAB each filed a petition requesting that the Commission reconsider the push notification requirement, although each express different concerns with the requirement. Google contends that the Commission failed to recognize that, as a technical matter, requiring databases to "push" information to devices is at least as burdensome as requiring devices to "pull" information from databases.<sup>40</sup> Google states that in order for a database to send information to a white space device, the device must either request information very frequently to simulate a push, which dramatically increases server utilization and reduces battery life in devices relying on such a power source, or the device must maintain a persistent connection with the database, which uses bandwidth and reduces battery life by preventing the device from entering a sleep mode.<sup>41</sup> It argues that the push rule would limit the use of battery powered, low-bandwidth, or remote white space devices designed to operate for very long periods on a single battery charge.<sup>42</sup> It also argues that unless an unlicensed device makes frequent "pulls" from the database or maintains a persistent, open connection, security features implemented on the device or network may block database messages from reaching the device.<sup>43</sup> Google further argues that limiting the geographic area for database pushes does not reduce the burden on unlicensed devices or databases because there is no way for a database to communicate information to a particular device unless all devices in all locations continually check for updates.<sup>44</sup>

14. NAB argues that the push notification requirement is insufficient for providing technical assurance that white space devices will actually receive messages and cease operation on channels registered for use by licensed wireless microphones, and is concerned that white space devices may be used in internal private networks protected by firewalls that prevent external messaging.<sup>45</sup> NAB states that if the Commission maintains the push notification approach, it must modify the rules to require that white space devices be capable of receiving notifications, including when they are not in operation or connected to the internet, and further that devices send the database a confirmation when they have received and complied with a push notification.<sup>46</sup>

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<sup>37</sup> *White Spaces Report and Order*, 30 FCC Rcd at 9662-63, paras. 273-74, 276.

<sup>38</sup> The database administrators need to push this information only to white space devices that are located within the separation distances specified in Section 15.712(f)(1) from the location specified by the wireless microphone registrant. This requirement does not apply to Mode I personal/portable devices since they obtain their channel list through another device rather than directly from the white space database. 47 CFR § 15.703.

<sup>39</sup> *Id.* at 9662, para. 274; 47 CFR 15.711(i)(3).

<sup>40</sup> Google Petition at 2.

<sup>41</sup> Google Petition at 2-5.

<sup>42</sup> Google Petition at 6-7.

<sup>43</sup> Google Petition at 4.

<sup>44</sup> Google Petition at 6.

<sup>45</sup> NAB Push Notification Petition at 5. NAB also states that while the existing white space rules allow fixed devices without a direct connection to the Internet to begin operations on a channel, the new rules do not contemplate how such devices will determine that a channel is no longer available and cease transmitting.

<sup>46</sup> NAB Petition at 7.



15. Other commenters agree that the Commission should reconsider the push notification requirement, though for different reasons. White space device proponent Microsoft argues that the push notification rule is technologically infeasible and contrary to the Commission's stated goal of not imposing too great a burden on database administrators and white space device users.<sup>47</sup> Wireless microphone manufacturer Sennheiser states that petitions filed both by NAB and Google raise valid concerns that some unlicensed devices will not receive a pushed message because of the use of firewalls.<sup>48</sup>

16. Petitioners and commenting parties disagree, however, on what they view as the appropriate approach going forward. Google requests that the Commission require white space devices to contact the database more frequently on two designated "fast polling" channels, an approach similar to the one that Google had made in response to the *White Spaces NPRM*<sup>49</sup> that the Commission had previously rejected in the *White Spaces Report and Order*.<sup>50</sup> Google again suggests that the Commission can protect licensed wireless microphones by identifying two channels on which unlicensed devices would be required to query the database every 20 minutes, while allowing white space devices operating on other channels to check the database only once daily.<sup>51</sup> It argues that designating two "fast-polling" channels would minimize the burden of constant rechecking on unlicensed devices and database operators, while providing adequate protection for wireless microphones used during breaking news events.<sup>52</sup> Microsoft agrees with Google's suggestion.<sup>53</sup> Google and Microsoft point out that under the previous rules only two channels were available on short notice for exclusive wireless microphone use and argue that because licensed wireless microphone users have access to a dedicated four-megahertz channel in the 600 MHz duplex gap and the ability to reserve channels in advance of predictable events like games and concerts, designating two fast-polling channels would leave wireless microphone operators no worse off than before.<sup>54</sup>

17. NAB requests that, in place of a push notification, the Commission require white space devices operating on any channel to contact the database every 20 minutes for an updated list of available channels, consistent with the Commission's proposal in the *White Spaces NPRM*.<sup>55</sup> NAB argues that requiring white space devices to contact the database to check on channel availability more frequently, coupled with a requirement that devices cease operation if they cannot contact the database, is simpler,

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<sup>47</sup> Microsoft Opposition at 16-17. Microsoft states that most networks will prevent this approach from working because they do not permit unsolicited incoming Internet traffic to reach devices on the local network. It states that there are ways of working around this limitation, but these techniques would be either technically identical to high-frequency database 'pull' or would be even more costly to implement.

<sup>48</sup> Sennheiser Opposition at 8.

<sup>49</sup> Google Petition at 8-9.

<sup>50</sup> *White Spaces Report and Order*, 30 FCC Rcd at 9663-64, para. 277.

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

<sup>52</sup> *Id.* Google states that the Commission can identify the fast-polling channels in each market using a simple and consistent set of rules, e.g., the lowest two available UHF channels. Google Petition at 10.

<sup>53</sup> Microsoft Opposition at 17-19. Microsoft argues that the "fast-polling" channel proposal is simply a version of the high-frequency pull proposal discussed in the *White Spaces NPRM* for a limited set of channels, and that it would satisfy the Commission's obligation to give proper notice. It argues that the decision to require database push notifications was procedurally improper since the *White Spaces NPRM* did not seek comment on implementing a push requirement. Microsoft Opposition at 14.

<sup>54</sup> Google Reply at 5 and Microsoft Reply at 8.

<sup>55</sup> NAB Push Notification Petition at 6.

more efficient, more cost-effective, and will provide greater protection for licensed wireless microphones without requiring manufacturers to redesign devices.<sup>56</sup> Shure agrees with NAB's suggestion.<sup>57</sup>

18. Regarding Google's proposed solution of creating two fast-polling channels, NAB contends that Google misinterprets the intent of the Commission's push requirement and fails to reflect the policy balance the Commission attempted to strike.<sup>58</sup> NAB states that limiting polling to two channels does not provide licensed operations with the same capability and protection as under the Commission's previous rules or the same capability and protection as the Commission sought to provide with the push requirement.<sup>59</sup> NAB further argues that Google's claim that polling on all channels would drive up database costs and adversely decrease device battery life is specious because the entire TV white space database is less than a couple of hundred kilobytes of data.<sup>60</sup> Google counters that the issue is the frequency of database requests, not the size of the database or the amount of information transmitted in each request, and that increasing the number of requests 72-fold per day per device will be a burden on the database as white space devices become more widely deployed.<sup>61</sup>

19. Only Key Bridge, a database administrator, disagrees that implementing a push capability for white space devices and databases is impractical.<sup>62</sup> It argues that the Commission's requirement to implement push notifications is sound and should be upheld, and that the Commission should reject Google's and NAB's objections that managing white space devices is too difficult to implement.<sup>63</sup>

20. *Push Notification Waiver Order.* By late 2016, while the petitions on push notification remained pending, no manufacturers had yet obtained certification for equipment that was capable of meeting the push notification requirement.<sup>64</sup> Absent Commission action, all approved white space devices would have been required to cease operation no later than December 23, 2016.<sup>65</sup> Accordingly, on December 22, 2016, the Commission adopted the *Push Notification Waiver Order* temporarily waiving the push notification requirements.<sup>66</sup> OET has periodically extended this waiver several times since then, most recently on September 30, 2021 when it extended this waiver through March 31, 2022, or until the Commission takes final action on the petitions for reconsideration of the push notification rules,

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<sup>56</sup> NAB Push Notification Petition at 5-6. It states that white space rules in the United Kingdom and elsewhere have no push notification requirement and instead rely on frequent polling by devices, so devices manufactured for the U.S. market under the Commission's approach cannot be certified for use outside the U.S. and vice-versa, which will prevent device harmonization and keep device prices high.

<sup>57</sup> Shure Opposition at 6. Shure argues that if the push notification approach is maintained, the rules must also specify additional requirements to ensure that devices receive notifications and cease operating on a channel that is no longer available.

<sup>58</sup> NAB Opposition at 8.

<sup>59</sup> NAB Opposition at 9.

<sup>60</sup> NAB Opposition at 11.

<sup>61</sup> Google Reply at 5.

<sup>62</sup> Key Bridge Reply at 6.

<sup>63</sup> Key Bridge Reply at 6.

<sup>64</sup> *Amendment of Part 15 of the Commission's Rules for Unlicensed Operations in the Television Bands, Repurposed 600 MHz Band, 600 MHz Guard Bands and Duplex Gap, and Channel 37*, Order, 31 FCC Rcd 13798, para.1 (2016) (*Push Notification Waiver Order*).

<sup>65</sup> *Push Notification Waiver Order*, 31 FCC Rcd at 13799, para. 5.

<sup>66</sup> *Push Notification Waiver Order*, 31 FCC Rcd 13798.

whichever comes earlier.<sup>67</sup> As a result of these successive waiver orders, the push notification requirement has never come into effect. We note that since issuance of these waiver orders, no party has submitted additional suggestions for Commission consideration relating to the pending petitions.

## B. Discussion

21. The record before us shows that the push notification requirement is viewed as problematic by advocates for licensed wireless microphone and white space device operations alike. The Commission's goal all along has been to adopt rules that would serve to protect licensed wireless microphones quickly following registration while also minimizing the burden on white space device operations.<sup>68</sup> Although we believe that a push notification approach is technically achievable, and note that the Commission has required access systems with rapid response times that, like the push notification, are more complicated than a periodic database re-check in other bands (such as in the Citizens Broadband Radio Service<sup>69</sup>), we agree with most commenters and conclude that there is no reason to require a push notification approach with respect to white space devices and the white spaces database system. As discussed below, replacing the push notification requirement with a more frequent re-check requirement will meet the requisite need for protecting a limited number of registered wireless microphones, and do so in a sufficiently expeditious fashion while not increasing the cost and complexity of white space devices and the database system by avoiding the need to redesign existing white space devices and the database system.

22. Therefore, on reconsideration, we replace the push notification requirement for fixed and Mode II personal/portable devices operating in the TV bands with a simpler and more easily implementable approach, namely requiring that these fixed and personal/portable white space devices re-check the white space database at least once every hour, i.e., no longer than 60 minutes between re-checks.<sup>70</sup> This frequent re-check requirement will protect licensed wireless microphone operations

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<sup>67</sup> *Amendment of Part 15 of the Commission's Rules for Unlicensed Operations in the Television Bands, Repurposed 600 MHz Band, 600 MHz Guard Bands and Duplex Gap, and Channel 37*, Order, DA 21-1229 (rel. Sep. 30, 2021).

<sup>68</sup> *White Spaces Report and Order*, 30 FCC Rcd at 9662, para. 273.

<sup>69</sup> *Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, Report and Order and Second Further Notice of Proposed Rulemaking, 30 FCC Rcd 3959, 3978, para. 54 (2015). From the start, the database system for the Citizens Broadband Radio Service has been designed to be a sophisticated, robust Spectrum Access System (SAS) capable of rapidly managing three tiers of authorized users with different levels of priority – the Incumbent Access users (which includes federal government radar systems and grandfathered satellite operations), the Priority Access Licenses (PALs), which must protect incumbent operations; and the General Authorized Access (GAA) users, which must protect both incumbent operations and PALs. *Id.* at 3978, para. 54. Unlike the white spaces system, the SAS rapidly coordinate the PAL and GAA frequency use. *Compare* 47 CFR § 15.715 (white space databases provide lists of available channels to white space devices but do not coordinate frequency use between them) *with* § 96.53 (the SAS facilitates coordination among users and resolves conflicting uses). Incorporated into the Citizens Broadband Radio Service rules is the requirement that Citizens Broadband Radio Service devices are required to cease operations, or move to different frequencies or change power levels, within 60 seconds of notification by the SAS. 47 CFR § 96.39(c)(2).

<sup>70</sup> This requirement does not apply to Mode I personal/portable devices since they obtain their channel list through another device rather than directly from the white space database. 47 CFR § 15.703. We do not change the database re-check interval for devices operating on frequencies outside of the TV bands, i.e., in the 600 MHz service bands, the upper six-megahertz segment of the 600 MHz duplex gap, and on channel 37 because licensed wireless microphones are not permitted to operate in these bands, and thus there is no need for a faster database re-check interval to protect wireless microphones. The upper six-megahertz segment of the duplex gap (657-663 MHz) is shared between white space devices and unlicensed wireless microphones; licensed wireless microphones may not operate in this band. 47 CFR §§ 15.236(c), 15.707(a)(2) and 74.802(a). Wireless microphones, both licensed and unlicensed, may not operate in channel 37 or in the 600 MHz service bands after the end of the post-incentive auction transition. 47 CFR §§ 74.802(f) and 15.236(c). There are currently no white space devices operating on channel 37.

shortly following their database registration and will effectively protect registered licensed wireless microphone operations.<sup>71</sup> We adopt the requirement for white space devices to check the database every hour rather than every 20 minutes as the Commission previously proposed because we believe that this time-frame will be sufficient to accommodate licensed wireless microphones for unplanned events while reducing threefold the number of database rechecks each day. Reducing the number of database rechecks is important to ensure efficient white space device operation, reduce overhead on the networks, and maximize battery life for white space devices that are not connected to a reliable power source. To further reduce the impact on network traffic and white space devices, we will not require devices that are in a sleep mode to re-check the database until they emerge from that state. Informed by the record before us, both by objections to the push notification requirement and by subsequent developments with regard to white space device operations, we again seek to reach the right balance between licensed wireless microphone users and white space device users that share use of unused spectrum in the TV bands. Also, we will apply this 60-minute re-check requirement (in place of a push notification requirement) with respect to the fixed, personal/portable and narrowband IoT white space devices and the mobile white space devices that the Commission authorized in the recently adopted 2020 *White Spaces Report and Order*.<sup>72</sup>

23. Although NAB and wireless microphone interests have requested requiring that white space devices re-check the database every 20 minutes, we believe that requiring a re-check every 60 minutes will be sufficient and, by relying on a re-check approach instead of the more complex push notification approach, our decision will serve to ensure the kind of reliable and effective protection those parties seek.<sup>73</sup> We also retain the requirement for database administrators to share Part 74 wireless microphone registration information with all other white space databases within ten minutes of a registration submission from a wireless microphone licensee. We find that these requirements will ensure that licensed wireless microphones used for electronic newsgathering and other unplanned uses can receive reliable and reasonably immediate protection from white space devices. In our considerations, we take into account that, following completion of the Incentive Auction in 2017, licensed wireless microphone users have immediate and exclusive access to a 4-megahertz portion of the 600 MHz duplex gap and can also use a 2-megahertz portion of the 600 MHz guard band where white space devices are not permitted to operate,<sup>74</sup> and that these wireless microphone operators potentially could make use of the 6-megahertz of the 600 MHz duplex gap available for unlicensed operations if white space devices are not operating at that location. Also, in many parts of the country we would expect that there are likely to be one or more unused vacant TV channels available for wireless microphones that are not being used by white space devices.

24. The balanced approach that we are adopting also does not impose an unreasonable burden on white space devices or database systems. Importantly, this approach is easily implementable. All currently approved white space devices already have the capability to re-check the white space databases at least once per day for a list of all available channels in their area, and updating software or firmware, or redesigning devices to increase the frequency of database checking is a fairly simple

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<sup>71</sup> We also note that this change will ensure that, because white space devices operating in the TV bands will be receiving up-to-date information on licensed wireless microphone use once per hour instead of once per day (as has been the case under the waiver orders as the petitions for reconsideration remained pending), licensed wireless microphone users will now receive more immediate interference protection to help meet their needs.

<sup>72</sup> *Unlicensed White Space Device Operations in the Television Bands*, ET Docket No. 20-36, Report and Order and Further Notice of Proposed Rulemaking, 35 FCC Rcd 12603, 12623-24, 12627-28, paras. 53, 64-65 (2020) (*2020 White Spaces Report and Order*).

<sup>73</sup> NAB Petition at 6, Shure Opposition at 5.

<sup>74</sup> 47 CFR §§ 74.802(a)(2) and 15.236(c)(5).

matter.<sup>75</sup> We also conclude that requiring white space devices to re-check on an hourly basis, rather than every 20 minutes as previously proposed, sufficiently balances concerns of the white space device proponents concerned about potential battery issues while meeting our goal of quickly ensuring licensed wireless microphone access to TV channels for late-breaking events. We also recognize the concerns of Google and Microsoft that frequently waking a device from a sleep mode or preventing a device from entering a sleep mode to perform more frequent database checks or receive push notifications, could needlessly reduce the operational time of a battery powered device.<sup>76</sup> Accordingly, we will not require white space devices in sleep mode to contact the database. We also believe that the increase in database traffic by changing to an hourly re-check interval will not be problematic for the white space database as computing power readily available today should be more than sufficient to manage twenty-four queries per day per white space device.<sup>77</sup>

25. We note, however, as the number of white space devices that contact the database increases, more frequent re-checks from a significantly larger number of devices could have an impact on the databases. We continue to believe that a push notification system could in some implementations potentially be more efficient if the number of white space devices that must contact the database is large. Accordingly, while we are not requiring implementation of a push notification system, we are retaining an option for white space device manufacturers and database administrators in the future to develop and implement such a system, as had been permitted by the rules in effect prior to the *White Spaces Report and Order*.<sup>78</sup> However, we are not specifying detailed technical requirements for a push notification system. We encourage the industry, if it determines that the need develops, to collaborate on a standard for push notifications to white space devices and we will revisit this issue as necessary to facilitate the development and deployment of a system developed by industry that provides at least the same degree of protection to protected services as the rules we are adopting herein.

26. We reject the suggestion by Google and Microsoft that we should limit more frequent database re-checking to white space devices operating on only two designated channels, a reprise of the approach that the Commission previously rejected in the *White Spaces Report and Order* in 2015.<sup>79</sup> We do so for the same reasons. Because only a few channels would be designated for “fast polling,” this approach is less flexible in meeting the needs of wireless microphone users for immediate access to spectrum because broadcasters covering breaking news events may have wireless microphones that operate on channels other than those designated for “fast polling.”<sup>80</sup>

27. The hourly re-check interval that we are adopting will apply to all white space devices that must obtain a channel list directly from the database to determine channels available for their operations – i.e., fixed, Mode II personal portable, and mobile devices that are currently subject to a once daily database recheck requirement.<sup>81</sup> Narrowband white space devices, which the Commission authorized in the *2020 White Spaces Report and Order*, are a type of fixed or personal/portable device

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<sup>75</sup> We address transition provisions for previously approved and currently operational devices below.

<sup>76</sup> The rules define a sleep mode as one in which a device is inactive but is not powered down. 47 CFR § 15.711(d).

<sup>77</sup> Currently there are fewer than one thousand registered white space devices, and as this ecosystem expands in the coming years, the databases will be capable of handling increased database traffic. We note that database systems are well capable of handling a large number of communications with devices. For example, as of July 27, 2021, SAS databases for the Citizens Broadband Radio Service were reported to have been handling over 100,000 devices deployed by one wireless infrastructure provider. See, e.g., <https://www.prnewswire.com/news-releases/network-operators-deploy-over-100-000-cambium-networks-cbrs-fixed-wireless-broadband-devices-301341803.html>.

<sup>78</sup> 47 CFR § 15.711(b)(3)(v) (2014).

<sup>79</sup> *White Spaces Report and Order*, 30 FCC Rcd at 9663-64, para. 277.

<sup>80</sup> *White Spaces Report and Order*, 30 FCC Rcd at 9664, para. 277.

<sup>81</sup> 47 CFR §§ 15.711(c)(2)(iii), (d)(4), (k)(9).

that may be used in IoT applications.<sup>82</sup> As a type of fixed or personal/portable device, narrowband white space devices must meet the hourly database re-check requirements.<sup>83</sup> While we expect that many narrowband IoT devices will be battery powered,<sup>84</sup> we believe the requirement that devices need not re-check the database while in a sleep mode will help ensure that the more frequent re-check requirement will not be a problem for battery powered narrowband devices. The hourly re-check will equally apply to mobile white space devices that also were first authorized in the *2020 White Spaces Report and Order*.<sup>85</sup> Like fixed and Mode II personal/portable white space devices, before operating in the TV bands these mobile white space devices are required to communicate with the database to determine available channel(s) and permitted power levels so as to ensure that white space devices do not cause harmful interference to protected services operating in the TV bands.<sup>86</sup> Mobile devices, which are mounted on a moveable platform such as a school bus or agricultural equipment, should be able to draw power from a vehicle's electrical system, and thus we do not expect that a more frequent re-check interval will raise concerns about battery life for mobile devices.<sup>87</sup>

28. *Conforming edits.* Because we are adopting a 60-minute re-check requirement, we also are modifying certain other rules to conform our rules to this change. In particular, our changes involve eliminating the existing rule provisions requiring white space devices to access the database on a daily basis.

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<sup>82</sup> *2020 White Spaces Report and Order*, 35 FCC Rcd at 12627-28, paras. 64-65; 47 CFR §§ 15.703, 15.709(b)(4).

<sup>83</sup> This requirement does not apply to narrowband Mode I personal/portable devices since they obtain their channel list through a fixed or Mode II personal/portable device rather than directly from the white space database. 47 CFR § 15.703.

<sup>84</sup> Google Petition at 6-7.

<sup>85</sup> *2020 White Spaces Report and Order*, 35 FCC Rcd at 12622-26, paras. 50-60 (authorizing mobile white space devices). In the underlying NPRM, the Commission had proposed allowing white space devices installed on “mobile platforms” to operate with higher power than the rules permit for personal/portable devices, with each device’s available channels, permitted power levels, and geographic areas of operation determined by requiring that the device load channel availability information from the database at multiple locations near the device’s current location, which would then be used to define a geo-fenced area in which these devices could operate. *See id.* at 12623, para. 51 (citing *Unlicensed White Space Device Operations in the Television Bands*, ET Docket No. 20-36, Notice of Proposed Rulemaking, 35 FCC Rcd 2101, 2114, para. 39). In its 2020 decision, the Commission permitted operation of white space devices on mobile platforms within defined geo-fenced areas, as proposed. *2020 White Spaces Report and Order*, 35 FCC Rcd at 12622-23, para. 53. While it had considered whether to classify these white space devices as Mode II “personal/portable” devices (as advocated by wireless microphone advocates Shure and Sennheiser) or “fixed” (as advocated by white space device advocate Microsoft), the Commission ultimately decided that it was clearer and simpler to establish a new class of white space device termed “mobile white space device.” *Id.* The Commission nonetheless modeled several of the rules for mobile devices on those for fixed devices, including power limits and minimum separation distances from protected services, to ensure that mobile white space devices would not cause harmful interference to protected services. *Id.* at 12623-25, paras. 54-57.

<sup>86</sup> As the Commission noted, the white space database will determine channel availability over a defined geo-fenced area where the mobile device will operate. It required that the white space database and mobile device contain the same boundary information relating to the geo-fenced area to ensure that mobile devices operate where the database has determined available channels. And because mobile devices operate with the same maximum power levels as fixed white space devices, the Commission required that the database use the same minimum separation distances from all protected services in the TV bands as fixed devices in determining available channels. *Id.* 12623, para. 55. As we make clear in the instant decision, and the Commission made clear when establishing the push notification requirement, licensed wireless microphones registered in the database are “protected services.” *See 2015 White Spaces Report and Order*, 30 FCC Rcd at 9661, para. 270.

<sup>87</sup> *2020 White Spaces Report and Order*, 35 FCC Rcd at 12623, para. 53.

29. Under current rules, a white space device is required to re-check the database at least once per day to obtain a list of available channels for operation.<sup>88</sup> The rules also provide that if a white space device subsequently is unable to make contact with a database, operation on the following day is permitted to continue to operate until 11:59 PM on that following day, and if by then, it cannot contact the database, it must cease operation until such time as it re-establishes contact.<sup>89</sup> The Commission proposed eliminating these provisions when it proposed in its 2014 *White Spaces NPRM* to adopt a 20-minute re-check requirement for addressing registered licensed wireless microphone operations so that the rules would be consistent and require that white space devices check for channel availability every 20 minutes.<sup>90</sup> When, however, the Commission adopted the push notification requirement in the *White Spaces Report and Order* instead of a 20-minute re-check requirement, it concluded that it should not eliminate the then-existing daily re-check rule and instead would leave in place the requirement that white space devices re-check the database at least once per day to obtain the list of available TV channels at the location where the device operates.<sup>91</sup>

30. Because we now adopt a 60-minute re-check requirement for white space devices operating in the TV bands, we modify the rules that require white space devices to only re-check the database once a day to obtain a list of available channels, and that permit these devices to continue operating using a channel on that list until 11:59 PM the following day when it cannot contact a database on a given day.<sup>92</sup> Maintaining these rules would be inappropriate since this would allow white space devices that cannot contact a database to operate for a significantly longer time period than the 60-minute re-check interval we are requiring for protecting licensed wireless microphones operating in the TV bands. We note that in response to the Commission's proposal in the *White Spaces NPRM* to require that white space devices re-check the database every 20 minutes, several commenters agreed that the daily re-check provision in the rules, and permitting white space device to continue operating until 11:59 PM the following day when it is unable to contact the database, should be eliminated.<sup>93</sup> Some commenters cautioned, though, that the Commission should permit a white space device to retry contacting the database one or more times before requiring that it discontinue operating because a white space device may occasionally be unable to make contact with the database within the designated polling interval.<sup>94</sup> We agree. Accordingly, to ensure that white space devices may continue to operate during short network outages, we will require a white space device to cease operation after two failed scheduled checks, i.e., 120 minutes. This requirement will ensure that a white space device cannot continue to operate for an extended period of time on a channel that may be registered for use by a licensed wireless microphone in the event the white space device cannot contact a database to verify the list of available channels. This

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<sup>88</sup> 47 CFR § 15.711(b)(3)(iii), (d)(4).

<sup>89</sup> 47 CFR § 15.711(h).

<sup>90</sup> *White Spaces NPRM*, 29 FCC Rcd at 12306, para. 190.

<sup>91</sup> *White Spaces Report and Order*, 30 FCC Rcd at 9664, para. 278. The Commission took that action to ensure that white space devices receive channel lists from the database indicating those channels that wireless microphone users reserve in advance, and that devices will be able to continue to operate on any available channel unless they receive a push notification indicating a change in a channel's availability.

<sup>92</sup> 47 CFR § 15.711(h).

<sup>93</sup> NAB Comments, ET Docket No. 14-165, at 13 (Feb. 4, 2015); Motorola Comments, ET Docket No. 14-165, at 3-4 (Feb. 4, 2015); Spectrum Bridge Comments, ET Docket No. 14-165, at 7 (Feb. 2, 2015).

<sup>94</sup> Motorola Comments, ET Docket No. 14-165, at 3-4 (Feb. 4, 2015) (permit two nominal database query cycles); Spectrum Bridge Comments, ET Docket No. 14-165, at 7 (Feb. 2, 2015) (single 20-minute grace period); White Space Alliance Comments, ET Docket No. 14-165, at 25 (Feb. 4, 2015) (permit several polling intervals). In its petition for reconsideration, NAB suggested that, if the Commission decided to retain the push notification requirement, white space devices should be required to stop operating if they lost a connection to the databases for 40 minutes. NAB Petition at 15.

approach also is analogous to the current requirement that a white space device must cease operation after a time period no greater than two failed scheduled checks (a maximum of 48 hours for a re-check interval of 24 hours).<sup>95</sup>

31. Because we are reducing the length of time that white space devices may continue to operate when they cannot contact the database, we correspondingly reduce the time interval over which white space devices must adjust their channel usage in accordance with licensed wireless microphone scheduling information provided by the database.<sup>96</sup> We therefore require that the white space database provide registered licensed wireless microphones scheduling information for the two hour time period after the white space device contacts the database. The white space device must adjust its use of channels in accordance with this scheduling information, i.e., it must cease using the channel during the times when a licensed wireless microphone is scheduled to use it. We select a time period of two hours because that is the maximum time that a white space device may operate if it is unable to contact the database. We do not require white space devices operating outside the TV bands, i.e., in the 600 MHz service bands, the upper 6-megahertz portion of the 600 MHz duplex gap and on channel 37, to adjust their use of channels in accordance with scheduling information provided by the white space database because wireless microphones do not operate on those frequencies on a licensed basis and thus there will be no scheduling information for the database to provide.<sup>97</sup>

32. We modify Section 15.711 to implement the changes to the database re-check interval discussed above, and to streamline the applicable rules. Specifically, we revise paragraph (i) to remove the push notification requirement and replace it with an option for manufacturers to develop a push notification system as the pre-2015 rules allowed. We move the requirement for white space databases to share licensed wireless microphone registrations with other white space databases within ten minutes from Section 15.711(i)(1) to Section 15.715(l).<sup>98</sup> We revise Section 15.711(h) to place the database re-check requirements for the three types of white space devices that must access a database (fixed, mobile and Mode II personal/portable) in a single paragraph, rather than placing them in three separate paragraphs as under the current rules.<sup>99</sup>

33. *Transition.* We also adopt provisions establishing the transition requirements for white space device compliance with the newly established re-check requirements as set forth herein. We note that increasing the frequency of database checks can generally be done by reprogramming a white space device's software or firmware, thus enabling the new requirement to be met relatively quickly.<sup>100</sup> Accordingly, we require that devices for which a certification application is approved by a Telecommunication Certification Body (TCB) beginning six months after the effective date of the rules must comply with the hourly database re-check requirement that replaces the daily re-check requirement. We also require that within six months after the effective date of the rules, all white space devices imported into or marketed within the United States comply with these requirements, regardless of when they were certified. Because white space devices already deployed generally should be able to download a software upgrade, we also require that previously approved fixed white space devices that can be re-programmed comply with the faster re-check requirement six months after the effective date of the rules.

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<sup>95</sup> 47 CFR § 15.711(h).

<sup>96</sup> 47 CFR § 15.711(c)(2)(iii), (d)(4), (k)(9).

<sup>97</sup> *Id.*

<sup>98</sup> 47 CFR §§ 15.711(i)(1), 15.715(l). Section 15.715(l) contains a requirement for white space databases to share registration data with other databases.

<sup>99</sup> 47 CFR § 15.711(b)(2)(iii), (d)(4), (k)(9). We revise each of these paragraphs to reference the database re-check requirement in Section 15.711(h).

<sup>100</sup> *See also* NAB Push Notification Petition at i,



Finally, we modify Section 15.37(j) to specify these transition dates for the faster database re-check interval in place of the transition dates for the push notification requirement that we eliminate.<sup>101</sup>

34. *Limited extension of the push notification waiver.* The Commission's December 23, 2016 waiver of the push notification requirements, as extended on September 30, 2021, expires no later than March 31, 2022, which may occur prior to the effective date of the rule changes we are adopting that eliminate the push notification requirement for white space devices and databases.<sup>102</sup> Accordingly, we extend the push notification waiver to coincide with the effective date of the new rules, i.e., 30 days after publication in the Federal Register.

#### IV. ORDER

35. In this Order, we deny NAB's petition for reconsideration of OET's 2018 action designating Nominet UK as a white space database administrator.<sup>103</sup> OET referred this petition to the Commission for action pursuant to Section 1.106(a) of the rules.<sup>104</sup> Nominet addressed concerns raised by NAB shortly after it filed its petition. We note that in 2020 Nominet's database was subsequently transferred to RED Technologies,<sup>105</sup> which currently serves as a white spaces database administrator.

36. *Background.* Pursuant to the white spaces rules, the Commission can designate one or more entities to administer a white space database system that provides lists of available channels to fixed, mobile and Mode II personal/portable white space devices.<sup>106</sup> On November 16, 2017, Nominet filed a proposal with OET seeking to administer a white space database.<sup>107</sup> After seeking comment on Nominet's proposal,<sup>108</sup> on June 11, 2018, the Commission's OET designated Nominet as a white space database administrator, subject to certain conditions, including that Nominet's database would be subject to a 45-day public trial period before it would be made available for actual use by white space devices to allow interested parties an opportunity to check that the database is providing accurate results.<sup>109</sup>

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<sup>101</sup> 47 CFR § 15.37(j).

<sup>102</sup> 47 CFR §§ 15.37(j), 15.711(i).

<sup>103</sup> NAB Designation Petition (ET Docket No. 04-186), <https://ecfsapi.fcc.gov/file/1019914006524/Petition%20for%20recon%20of%20Nominet%20approval.pdf> (NAB Petition); Letter from Julius P. Knapp, Chief, Office of Engineering and Technology, to Nominet UK, DA 18-967, 33 FCC Rcd 8792 (OET Sept. 19, 2018); *Office of Engineering and Technology Announces the Approval of Nominet UK's White Space Database System for Operation*, Public Notice, DA 18-966, 33 FCC Rcd 8790 (OET 2018) (Nominet Approval Letter).

<sup>104</sup> 47 CFR § 1.106(a)(1). Petitions requesting reconsideration of final actions taken pursuant to delegated authority are acted on by the designated authority or may be referred by such authority to the Commission. *Id.*

<sup>105</sup> *Office of Engineering & Technology Announces Transfer of Ownership and Control of White Space Database from Nominet UK To RED Technologies*, Public Notice, DA 20-904, 35 FCC Rcd 9610 (OET 2020).

<sup>106</sup> 47 CFR § 15.715.

<sup>107</sup> *Unlicensed Operation in the TV Broadcast Bands*, ET Docket No. 04-186, Proposal by Nominet UK to Serve as a White Spaces Database Administrator (Nov. 16, 2017), <https://ecfsapi.fcc.gov/file/111609559633/Nominet%20-%20Database%20Administrator%20Proposal%20-%20Annex%20A.pdf>.

<sup>108</sup> *Office of Engineering and Technology Seeks Comment on Nominet UK Proposal to be Designated as a White Space Database Administrator*, ET Docket No. 04-186, Public Notice, 33 FCC Rcd 3554 (OET 2018), <https://ecfsapi.fcc.gov/file/04091228004065/DA-18-351A1.pdf>.

<sup>109</sup> *Unlicensed Operation in the TV Broadcast Bands*, ET Docket No. 04-186, Order, 33 FCC Rcd 5966 (2018), <https://ecfsapi.fcc.gov/file/0611229427453/DA-18-605A1.pdf>. Since the white spaces rules were first established in 2008, OET has designated other database administrators pursuant to its delegated authority. *Office of Engineering and Technology Announces the Approval of Spectrum Bridge, Inc.'s TV Bands Database System for Operation*, Public Notice, DA 11-2043, 26 FCC Rcd 16924 (OET 2011); *Office of Engineering and Technology Announces the*

(continued....)

37. Following the 45-day public trial period, on September 19, 2018, OET gave final approval for Nominet to operate its white space database system.<sup>110</sup> OET found that Nominet's white space database system was compliant with the Commission's rules and ready for operation, based on its own examination and testing of the Nominet database system and on the results of the public trial, including comments submitted to Nominet during and after the trial and Nominet's responses to those comments.<sup>111</sup> As OET noted, during the trial period Nominet indicated that it successfully resolved three issues raised by NAB concerning Nominet's database system, including concerns about its channel availability calculator.<sup>112</sup>

38. On October 19, 2018, NAB filed a petition for reconsideration of OET's designation of Nominet as a white space database administrator.<sup>113</sup> NAB states that its review of Nominet's database indicated that it contains incorrect channel information for hundreds of TV stations and that it provides at least one incorrect available channel at more than three-quarters of twenty-six locations analyzed.<sup>114</sup> NAB states that the Nominet database is extracting the wrong information from the Commission database and that its approval should be revoked until Nominet addresses these issues.<sup>115</sup> NAB further argues that OET should rework its internal processes and policies for approval of white space database administrators to ensure that sufficient testing is performed to detect errors, including testing with actual white space devices.<sup>116</sup>

39. Nominet responded to NAB's petition by agreeing that NAB had identified discrepancies, but asserts that those discrepancies arose due to difficulties experienced when importing TV station data from the Commission's new Licensing and Management System (LMS), which had replaced the Commission's Consolidated Database System (CDBS). Nominet explains that it was the first database administrator required to use the LMS, and that all published material by the FCC regarding how to apply the white space rules to TV data pertains to CDBS, which had been used by all previous database administrators.<sup>117</sup> Nominet concludes by stating it promptly addressed NAB's concerns, and that the changes required to correct the import procedure were applied on October 24, 2018, only days after NAB

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*Approval of Telcordia Technologies, Inc.'s TV Bands Database System for Operation*, Public Notice, DA 12-466, 27 FCC Rcd 2934 (OET 2012); *Office of Engineering and Technology Announces the Approval of Google, Inc.'s TV Bands Database System for Operation*, Public Notice, DA 13-1472, 28 FCC Rcd 9191 (OET 2013); *Office of Engineering and Technology Announces the Approval of Key Bridge Global, LLC's TV Bands Database System for Operation*, Public Notice, DA 13-2211, 28 FCC Rcd 15838 (OET 2013); *Office of Engineering and Technology Announces the Approval of LStelcom AG's TV Bands Database System for Operation*, Public Notice, DA 14-1427, 29 FCC Rcd 11687 (OET 2014).

<sup>110</sup> Nominet Approval Letter, 33 FCC Rcd at 8794 (OET 2018).

<sup>111</sup> Nominet Approval Letter, 33 FCC Rcd at 8793 (OET 2018).

<sup>112</sup> Reply of Nominet, ET Docket No. 04-186, at 5-6 (filed Aug. 23, 2018) (Nominet Reply). Nominet states that it modified its system to import television channel information from the Commission's newer Licensing and Management System (LMS) rather than the older Consolidated Database System (CDBS). In addition, Nominet states that it corrected the information in its database for the single TV station in the LMS database with a particular facility status code, that it is not aware of any other TV station information that has not been properly imported into its database, and that it will correct any other incorrect information that is brought to its attention.

<sup>113</sup> NAB Designation Petition.

<sup>114</sup> NAB Designation Petition at 3-4.

<sup>115</sup> NAB Designation Petition at 4.

<sup>116</sup> NAB Designation Petition at 4-6.

<sup>117</sup> Nominet Reply at 2.

filed its petition for reconsideration on October 19, 2018.<sup>118</sup> NAB did not respond directly to Nominet's response or identify specific ongoing errors that needed remedying.<sup>119</sup>

40. We note that, subsequent to the designation of Nominet as a white space database administrator, and in response to a petition submitted by NAB in 2015,<sup>120</sup> the Commission took steps in the *2019 White Spaces Order* to improve the accuracy and reliability of the fixed white space device data in the white space databases and ensure that the potential for these devices to cause harmful interference to protected services is minimized.<sup>121</sup> Specifically, the Commission required all fixed white space devices to incorporate a geo-location capability such as GPS and eliminated the option that permitted the geographic coordinates of a fixed device to be determined by a professional installer.<sup>122</sup> The Commission also adopted rules that allow the use of external geo-location sources by a fixed white space device when the device is used at a location where its internal geo-location capability does not function, such as deep inside a building.<sup>123</sup> In addition, the Commission required fixed white space devices to re-check their geographic coordinates at least once a day and report the coordinates to the white space database.<sup>124</sup>

41. *Discussion.* We deny the NAB petition for reconsideration of OET's designation of Nominet as a white space database administrator. We find that the database errors discovered by NAB, which were immediately corrected by Nominet, are not grounds to revoke the designation of Nominet as a white space database administrator. As Nominet notes in its response to NAB's petition, Nominet was the first white space database administrator required to obtain TV station data from the Commission's new LMS instead of the older, well-understood CDBS.<sup>125</sup> The LMS has a more sophisticated data structure than the CDBS, thus requiring new and more complex algorithms than those used by other white space database administrators to extract the proper TV station facility information ("extraction logic") for input into the white space database.<sup>126</sup> OET worked closely with Nominet to test the new extraction logic using Nominet's trial database to ensure that it functioned correctly. It appears that Nominet failed to include all of the updates made to the test database reviewed by OET in the final version that it made

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<sup>118</sup> *Id.*

<sup>119</sup> NAB filed two *ex parte* letters summarizing discussions with the Office of the Chairman and OET concerning its petition for reconsideration and expressing concern over the process used by OET to review and approve white space database administrators. NAB also generally alleged continued errors in the database but provided no information that OET or Nominet could use to investigate the allegation. Letter from Patrick McFadden, Associate General Counsel, National Association of Broadcasters, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 04-186 at 1-2 (filed Nov. 29, 2018); Letter from Patrick McFadden, Associate General Counsel, National Association of Broadcasters, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 04-186 at 1-2 (filed Dec. 11, 2018).

<sup>120</sup> National Association of Broadcasters, Emergency Motion for Suspension of Operations and Petition for Rulemaking, RM-11745, March 19, 2015 (NAB Petition). NAB alleges that there are data errors in the registration records for fixed devices in the white space databases, argues that the accuracy of this data is critical for avoiding interference to licensed users of the spectrum, and requests that the Commission undertake rulemaking and other actions to correct and avoid such errors.

<sup>121</sup> *2019 White Spaces Order*, 34 FCC Rcd at 1828, para. 2.

<sup>122</sup> *2019 White Spaces Order*, 34 FCC Rcd at 1830-31, para. 11.

<sup>123</sup> *2019 White Spaces Order*, 34 FCC Rcd at 1833, para. 17.

<sup>124</sup> *2019 White Spaces Order*, 34 FCC Rcd at 1835-36, para. 24.

<sup>125</sup> Nominet Reply at 2.

<sup>126</sup> The LMS often has multiple data records for a single TV station, e.g., it may have a record for the licensed parameters, a construction permit for changes, an auxiliary transmitter for use when the main transmitter is temporarily out-of-service, and a special temporary authorization (STA). Since the white space database is intended to protect operating facilities, the extraction logic may have to parse multiple records to determine which one contains the parameters under which a TV station is currently operating, and then transfer the appropriate information to the white space database.

available for commercial use. As noted above, Nominet took action to remedy specific concerns raised by NAB. While we are denying NAB's petition, we underscore that we appreciate NAB bringing these concerns to the attention of the Commission and Nominet so that the errors could be remedied. However, we do not believe that these errors show any fundamental deficiency on the part of the database administrator but appear to be the result of issues related to the Commission's transition from the CDBS to the LMS combined with an inadvertent failure by Nominet to include all of the latest updates in its final version of the database.<sup>127</sup> Nominet promptly recognized its ongoing responsibility for remedying concerns brought to its attention. As noted above, in 2020, Nominet transferred its database to RED Technology,<sup>128</sup> and NAB did not indicate any concerns about this transfer.

42. The Commission takes seriously the integrity of the white space database since that is the primary means to prevent white space devices from causing harmful interference to TV reception and other protected services. As noted above, the Commission at the suggestion of NAB took steps to increase the integrity of the white space database subsequent to the 2018 designation of Nominet as a white space database administrator. The changes adopted in the *2019 White Spaces Order* will ensure that fixed white space devices provide accurate coordinates to the white space database by requiring the incorporation of a geo-location mechanism in all fixed devices, as well as periodic re-checking of the coordinates by the white space device.<sup>129</sup> The *2019 White Spaces Order* also clarifies the registration requirements for fixed white space devices.<sup>130</sup> These changes reduce the likelihood that fixed devices will report incorrect coordinates to the database, which could result in harmful interference to TV reception and protected services, as well as ensure the database contains accurate registration information that could be used to help track down any devices that cause harmful interference. OET will continue to work with any white space database administrator as well as any other interested party to ensure that the database provides accurate lists of available channels to white space devices.

## V. PROCEDURAL MATTERS

### A. Final Regulatory Flexibility Analysis

43. The Final Regulatory Flexibility Analysis, required by the Regulatory Flexibility Act, *see* 5 U.S.C. § 604, is contained in Appendix C.

### B. Paperwork Reduction Act

44. This document does not contain new or modified information collection requirements subject to the Paperwork Reduction Act of 1995 (PRA), Public Law 104-13. In addition, therefore, it does not contain any new or modified information collection burden for small business concerns with fewer than 25 employees, pursuant to the Small Business Paperwork Relief Act of 2002, Public Law 107-198, *see* 44 U.S.C. 3506(c)(4).

### C. Congressional Review Act

45. [The Commission will submit this draft Second Order on Reconsideration and Order to the Administrator of the Office of Information and Regulatory Affairs, Office of Management and Budget, for concurrence as to whether this rule is "major" or "non-major" under the Congressional Review Act, 5 U.S.C. § 804(2).] The Commission will send a copy of this Second Order on

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<sup>127</sup> It does not appear that NAB's suggestion to require field testing of white space devices would have prevented the database errors discovered in this instance since they were the result of an error in extracting data from a Commission database. However, we note that OET does require applicants for certification of white space devices to demonstrate that their devices will connect only with an approved white space database.

<sup>128</sup> *Office of Engineering & Technology Announces Transfer of Ownership and Control of White Space Database from Nominet UK To RED Technologies*, Public Notice, DA 20-904, 35 FCC Rcd 9610 (OET 2020).

<sup>129</sup> *2019 White Spaces Order*, 34 FCC Rcd at 1830-31, 1835-36 para. 11, 24.

<sup>130</sup> *2019 White Spaces Order*, 34 FCC Rcd at 1836, 1840, para. 27, 38.

Reconsideration and Order to Congress and the Government Accountability Office pursuant to 5 U.S.C. § 801(a)(1)(A).

**D. Contact Persons**

46. For additional information concerning this Second Order on Reconsideration and Order, please contact Mr. Hugh L. Van Tuyl at (202) 418-7506, or [Hugh.VanTuyl@fcc.gov](mailto:Hugh.VanTuyl@fcc.gov).

**VI. ORDERING CLAUSES**

47. Accordingly, IT IS ORDERED that, pursuant to the authority contained in Sections 4(i), 302, 303(b), (c), (e), (f), (r), and 307 of the Communications Act of 1934, as amended, and sections 6403 and 6407 of the Middle Class Tax Relief and Job Creation Act of 2012, Pub. L. No. 112-96, 126 Stat. 156, 47 U.S.C. §§ 154(i), 302, 303(b), (c), (e), (f), (r), 307, 1452, 1454, this Second Order on Reconsideration and Order IS HEREBY ADOPTED.

48. IT IS FURTHER ORDERED that the petitions for reconsiderations filed by Google, Inc. and the National Association of Broadcasters on December 23, 2015 in ET Docket No. 14-165 ARE GRANTED IN PART AND DENIED IN PART to the extent described herein.

49. IT IS FURTHER ORDERED that Part 15 of the Commission's rules IS AMENDED as specified in Appendix A, and such rule amendments WILL BECOME EFFECTIVE 30 days after the date of publication in the *Federal Register*.

50. IT IS FURTHER ORDERED that the waiver of Sections 15.37(j) and 15.711(i) of the Commission's rules, 47 CFR §§ 15.37(j) and 15.711(i), adopted by the Commission on September 30, 2021, DA 21-349, IS EXTENDED until the effective date of the rules adopted herein.

51. IT IS FURTHER ORDERED that the petition for reconsideration of Nominet UK's designation as a white space database administrator filed by the National Association of Broadcasters on October 19, 2018 in ET Docket No. 04-186 IS HEREBY DENIED.

52. IT IS FURTHER ORDERED that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of the Second Order on Reconsideration and Order, including the Final Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the U.S. Small Business Administration.

53. IT IS FURTHER ORDERED that the Office of the Managing Director, Performance Evaluation and Records Management, SHALL SEND a copy of this Second Order on Reconsideration and Order in a report to be sent to Congress and the Government Accountability Office pursuant to the Congressional Review Act, 5 U.S.C. § 801(a)(1)(A).

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch  
Secretary

## Appendix A

### Final Rules

For the reasons set forth in the preamble, the Federal Communications Commission amends part 15 of Title 47 of the Code of Federal Regulations to read as follows:

1. The authority citation for part 15 continues to read as follows:

**AUTHORITY:** [TO BE INSERTED PRIOR TO PUBLICATION OF SUMMARY IN FEDERAL REGISTER].

2. Amend section 15.37 revising paragraph (j) to read as follows:

#### § 15.37 Transition provisions for compliance with the rules.

\* \* \* \* \*

(j) White space devices which are approved by Telecommunication Certification Bodies beginning **[six months after the effective date of the rules]** shall comply with the database re-check requirements in § 15.711(h) of this part. White space devices that are in operation, imported or marketed beginning **[six months after the effective date of the rules]** shall also comply with these requirements

\* \* \* \* \*

3. Amend section 15.711 by revising paragraphs (c)(2)(iii), (d)(4), (h), (i) and (k)(9) to read as follows:

#### §15.711 Interference avoidance methods.

\* \* \* \* \*

(c) \* \* \*

(2) \* \* \*

(iii) A fixed white space device shall access the database at least as frequently as specified in paragraph (h) of this section to verify that the operating channel(s) and corresponding power levels continue to remain available. The fixed device's registration information shall be updated if the geographic coordinates reported to the database differ by more than  $\pm 50$  meters from the previously registered coordinates.

\* \* \* \* \*

(d) \* \* \*

(4) A Mode II personal/portable white space device that has been in a powered state shall re-check its location and access the database at least as frequently as specified in paragraph (h) of this section to verify that the operating channel(s) and corresponding power levels continue to be available.

\* \* \* \* \*

(h) *Database re-check requirement.*

(1) Devices operating in the television bands

(i) A fixed, mobile or Mode II personal/portable device that has been in a powered-on state shall access the white space database at least once every 60 minutes to verify that the operating channel(s) and associated maximum power levels continue to be available at their location (a single point for fixed and Mode II devices or a geo-fenced area for mobile devices). Devices shall adjust their channel usage in accordance with the most recent channel availability schedule information provided by the white space database for the two-hour period beginning at the time of the device last accessed the database for a list of available channels.

(ii) If a fixed, mobile or Mode II personal/portable device fails to successfully contact the white space database, it may continue to operate until no longer than 120 minutes after the last successful contact, at which time it must cease operations until it reestablishes contact with the white space database and re-verifies its list of available channels and associated maximum power levels.

(2) Devices operating outside of the television bands

(i) A fixed or Mode II personal/portable device that has been in a powered-on state shall access the database at least once a day to verify that the operating channel(s) and associated maximum power levels continue to be available.

(ii) If a fixed or Mode II personal/portable white space device fails to successfully contact the white space database during any given day, it may continue to operate until 11:59 p.m. of the following day at which time it must cease operations until it re-establishes contact with the white space database and re-verifies its list of available channels and corresponding power levels.

\* \* \* \* \*

(i) *Push notifications.* Device manufacturers and database administrators may implement a system that pushes updated channel availability information from the database to white space devices. However, the use of such systems is not mandatory, and the requirements for white space devices to validate the operating channel and to cease operation in accordance with paragraph (h) of this section continue to apply if such a system is used.

\* \* \* \* \*

(k) \* \* \*

(9) A mobile white space device that has been in a powered-on state shall access the database at least as frequently as specified in paragraph (h) of this section to verify that the operating channel(s) and associated maximum power levels continue to remain available.

\* \* \* \* \*

4. Amend section 15.715 by revising paragraphs (l) to read as follows:

**§15.715 White space database administrator.**

\* \* \* \* \*

(l) If more than one database is developed, the database administrators shall cooperate to develop a standardized process for providing on a daily basis or more often, as appropriate, the data collected for the facilities listed in §15.713(b)(2) to all other white space databases to ensure consistency in the records of protected facilities. In response to a request for immediate access to a channel by a licensed wireless microphone user, white space database administrators are required to share the licensed microphone channel registration information to all other white space database administrators within 10 minutes of receiving each wireless microphone registration.

\* \* \* \* \*



**Appendix B****List of Parties Filing Petitions for Reconsideration of the Push Notification Requirement**Petitions for Reconsideration

1. Google, Inc.
2. National Association of Broadcasters

Oppositions to Petitions for Reconsideration

1. Google, Inc.
2. Microsoft Corp.
3. National Association of Broadcasters
4. Sennheiser Electronic Corp.
5. Shure Incorporated
6. WMTS Coalition

Replies to Oppositions to Petitions for Reconsideration

1. GE Healthcare
2. Google, Inc.
3. Key Bridge LLC
4. Microsoft Corp.
5. National Association of Broadcasters

## Appendix C

### Final Regulatory Flexibility Analysis

As required by the Regulatory Flexibility Act of 1980, as amended (RFA),<sup>132</sup> an Initial Regulatory Flexibility Analysis (IRFA) was incorporated in the *Notice of Proposed Rule Making* (NPRM) in ET Docket No. 14-165.<sup>133</sup> The Commission sought written public comment on the proposals in the *NPRM*, including comment on the IRFA. This present Final Regulatory Flexibility Analysis (FRFA) conforms to the RFA.<sup>134</sup>

#### A. Need for, and Objectives of, the Second Order on Reconsideration and Order

The Second Order on Reconsideration addresses to petitions for reconsideration of the requirement for white space databases to “push” changes in channel availability information to unlicensed white space devices when a party registers a licensed wireless microphone in the database on a previously vacant channel (“push notifications”). It removes the push notification requirement and instead requires white space devices operating on television channels 2-36 to re-check the white space database on a more frequent basis to improve protection of licensed wireless microphones that also operate on those channels. Push notifications will be permitted, but not in lieu of the requirements to re-check the white space database. The Order denies a petition for reconsideration of the Office and Engineering and Technology’s 2018 designation of Nominet UK as a white space database administrator.

#### B. Summary of Significant Issues Raised by Public Comments in Response to the IRFA

There were no comments filed that specifically addressed the IRFA.

#### C. Response to Comments by the Chief Counsel for Advocacy of the Small Business Administration

Pursuant to the Small Business Jobs Act of 2010, the Commission is required to respond to any comments filed by the Chief Counsel for Advocacy of the Small Business Administration (SBA), and to provide a detailed statement of any change made to the proposed rules as a result of those comments. The Chief Counsel did not file any comments in response to the proposed rules in this proceeding.

#### D. Description and Estimate of the Number of Small Entities to Which the Rules Will Apply

The RFA directs agencies to provide a description of and, where feasible, an estimate of the number of small entities that may be affected by the proposed rules, if adopted.<sup>135</sup> The RFA generally defines the term “small entity” as having the same meaning as the terms “small business,” “small organization,” and “small governmental jurisdiction.”<sup>136</sup> In addition, the term “small business” has the same meaning as the

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<sup>132</sup> 5 U.S.C. § 603. The RFA, *see* 5 U.S.C. § 601 – 612, has been amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), Pub. L. No. 104-121, Title II, 110 Stat. 857 (1996).

<sup>133</sup> *Amendment of Part 15 of the Commission’s Rules for Unlicensed Operations in the Television Bands, Repurposed 600 MHz Band, 600 MHz Guard Bands and Duplex Gap, and Channel 37*, Notice of Proposed Rulemaking, 29 FCC Rcd 12248 (2014).

<sup>134</sup> *See* 5 U.S.C. § 604.

<sup>135</sup> *See* 5 U.S.C. § 603(b)(3).

<sup>136</sup> *See* 5 U.S.C. § 601(6).

term “small business concern” under the Small Business Act.<sup>137</sup> A “small business concern” is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the Small Business Administration (SBA).<sup>138</sup>

#### **Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing.**

This industry comprises establishments primarily engaged in manufacturing radio and television broadcast and wireless communications equipment.<sup>139</sup> Examples of products made by these establishments are: transmitting and receiving antennas, cable television equipment, GPS equipment, pagers, cellular phones, mobile communications equipment, and radio and television studio and broadcasting equipment.<sup>140</sup> The SBA has established a small business size standard for this industry of 1,250 or fewer employees.<sup>141</sup> U.S. Census Bureau data for 2012 show that 841 establishments operated in this industry in that year.<sup>142</sup> Of that number, 828 establishments operated with fewer than 1,000 employees, 7 establishments operated with between 1,000 and 2,499 employees and 6 establishments operated with 2,500 or more employees.<sup>143</sup> Based on this data, we conclude that a majority of manufacturers in this industry are small.

**Television Broadcasting.** This Economic Census category “comprises establishments primarily engaged in broadcasting images together with sound.”<sup>144</sup> These establishments operate television broadcast studios and facilities for the programming and transmission of programs to the public.<sup>145</sup> These establishments also produce or transmit visual programming to affiliated broadcast television stations, which in turn broadcast the programs to the public on a predetermined schedule. Programming may originate in their own studio, from an affiliated network, or from external sources. The SBA has created the following small business size standard for such businesses: those having \$41.5 million or less in annual receipts.<sup>146</sup> The 2012 Economic Census reports that 751 firms in this category operated in that year.<sup>147</sup> Of that number, 656

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<sup>137</sup> See 5 U.S.C. § 601(3) (incorporating by reference the definition of “small-business concern” in the Small Business Act, 15 U.S.C. § 632). Pursuant to 5 U.S.C. § 601(3), the statutory definition of a small business applies “unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the Federal Register.”

<sup>138</sup> See 15 U.S.C. § 632.

<sup>139</sup> See U.S. Census Bureau, *2017 NAICS Definitions*, “334220 Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing”, <https://www.census.gov/cgi-bin/sssd/naics/naicsrch?code=334220&search=2017>.

<sup>140</sup> *Id.*

<sup>141</sup> See 13 CFR § 121.201, NAICS Code 334220.

<sup>142</sup> See U.S. Census Bureau, *2012 Economic Census of the United States*, Table ID: EC1231SG2, *Manufacturing: Summary Series: General Summary: Industry Statistics for Subsectors and Industries by Employment Size: 2012*, NAICS Code 334220, <https://data.census.gov/cedsci/table?text=EC1231SG2&n=334220&tid=ECNSIZE2012.EC1231SG2&hidePreview=false>.

<sup>143</sup> *Id.* Available census data does not provide a more precise estimate of the number of firms that have employment of 1,500 or fewer employees; the largest category provided is for firms with “1000 employees or more.”

<sup>144</sup> See U.S. Census Bureau, *2017 NAICS Definition*, “515120 Television Broadcasting”, <https://www.census.gov/cgi-bin/sssd/naics/naicsrch?input=515120&search=2017+NAICS+Search&search=2017>.

<sup>145</sup> *Id.*

<sup>146</sup> See 13 CFR § 121.201, NAICS Code 515120.

<sup>147</sup> See U.S. Census Bureau, *2012 Economic Census of the United States*, Table ID: EC1251SSSZ4, *Information: Subject Series – Estab and Firm Size: Receipts Size of Firms for the U.S.: 2012*, NAICS Code 515120,

(continued....)

had annual receipts of \$25,000,000 or less, and 25 had annual receipts between \$25,000,000 and \$49,999,999.<sup>148</sup> Based on this data we therefore estimate that the majority of commercial television broadcasters are small entities under the applicable SBA size standard.

The Commission has estimated the number of licensed commercial television stations to be 1,377.<sup>149</sup> Of this total, 1,258 stations (or about 91 percent) had revenues of \$38.5 million or less, according to Commission staff review of the BIA Kelsey Inc. Media Access Pro Television Database (BIA) on November 16, 2017, and therefore these licensees qualify as small entities under the SBA definition. In addition, the Commission has estimated the number of licensed noncommercial educational television stations to be 384.<sup>150</sup> Notwithstanding, the Commission does not compile and otherwise does not have access to information on the revenue of NCE stations that would permit it to determine how many such stations would qualify as small entities. There are also 2,300 low power television stations, including Class A stations (LPTV) and 3,681 TV translator stations.<sup>151</sup> Given the nature of these services, we will presume that all of these entities qualify as small entities under the above SBA small business size standard.

We note, however, that in assessing whether a business concern qualifies as “small” under the above definition, business (control) affiliations<sup>152</sup> must be included. Our estimate, therefore, likely overstates the number of small entities that might be affected by our action, because the revenue figure on which it is based does not include or aggregate revenues from affiliated companies. In addition, another element of the definition of “small business” requires that an entity not be dominant in its field of operation. We are unable at this time to define or quantify the criteria that would establish whether a specific television broadcast station is dominant in its field of operation. Accordingly, the estimate of small businesses to which rules may apply does not exclude any television station from the definition of a small business on this basis and is therefore possibly over-inclusive. Also, as noted above, an additional element of the definition of “small business” is that the entity must be independently owned and operated. The Commission notes that it is difficult at times to assess these criteria in the context of media entities and its estimates of small businesses to which they apply may be over-inclusive to this extent.

#### **E. Description of Projected Reporting, Recordkeeping, and Other Compliance Requirements for Small Entities**

White space devices are unlicensed devices that operate in the television bands, the upper portion of the 600 MHz duplex gap, the 600 MHz service bands and on channel 37 at locations where frequencies are not in use by licensed services. These devices may be fixed, mobile or portable. To prevent harmful interference to broadcast television stations and other protected users<sup>153</sup> of these bands, fixed, mobile and

<https://data.census.gov/cedsci/table?text=EC1251SSSZ4&n=515120&tid=ECNSIZE2012.EC1251SSSZ4&hidePreview=false>.

<sup>148</sup> *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard.

<sup>149</sup> *Broadcast Station Totals* as of June 30, 2018, Press Release (MB, rel. Jul. 3, 2018) (June 30, 2018 Broadcast Station Totals Press Release), <https://docs.fcc.gov/public/attachments/DOC-352168A1.pdf>.

<sup>150</sup> *Id.*

<sup>151</sup> *Id.*

<sup>152</sup> “[Business concerns] are affiliates of each other when one concern controls or has the power to control the other or a third party or parties controls or has the power to control both.” 13 C.F.R. § 21.103(a)(1).

<sup>153</sup> White space devices must protect: 1) digital television stations, and digital Class A TV, low power TV, TV translator and TV booster stations; 2) certain TV translator, low power TV (including Class A) and Multi-channel Video Programming Distributor (MVPD) receive sites; 3) fixed Broadcast Auxiliary Service (BAS) links; 4) Private Land Mobile Radio Service and Commercial Mobile Radio Service (PLMRS/CMRS) operations; 5) Offshore

(continued....)

some portable white space devices must obtain a list of available channels that may be used at their location from databases administered by private entities selected by the Commission. Fixed and mobile white space devices incorporate a geo-location capability and a means to access a database that provides a list of available channels and power levels that may be used at their operating location (a single point for fixed devices or a geo-fenced area for mobile devices). Personal/portable white space devices can either acquire a list of available channels via another device (Mode I) or include geo-location and database access capabilities (Mode II) that provides a list of available channels that may be used at their location. Fixed, mobile and Mode II personal/portable devices must contact a white space database at least once per day to obtain a list of available channels and must adjust their use of channels in accordance with channel availability schedule information provided by the database for the 48-hour period beginning at the time the device last accessed the database. If a white space device cannot contact a database on a given day, it may continue to operate until 11:59 PM the next day, after which time it must cease operation if it is unable to contact a database.

To ensure that channels are available for wireless microphones used for events that cannot be anticipated, such as late-breaking news events, the Commission decided in the *White Spaces Report and Order* to require that database administrators “push” information to white space devices in an area where a licensed wireless microphone will be used. When a database administrator receives a request for immediate access to channels for licensed wireless microphone use, it must share the licensed wireless microphone’s channel registration information with other database administrators within ten minutes, and database administrators must “push” information about changes in channel availability to fixed and Mode II personal/portable white space devices within 20 minutes of receiving it (“push notifications”). Two parties, Google, Inc. and the National Association of Broadcasters (NAB) filed petitions for reconsideration of the push notification requirement. Google argues that the requirement is overly burdensome for white space devices and the database and NAB argues that there is no assurance white space devices will actually receive the notifications.

Most RF transmitting equipment, including white space devices, must be authorized through the certification procedure. Certification is an equipment authorization issued by a designated Telecommunication Certification Body based on an application and test data submitted by the responsible party (e.g., the manufacturer or importer). The Second Order on Reconsideration and Order does not change the authorization procedure for white space devices, but it modifies certain technical requirements for them. Specifically, it eliminates the push notification requirement for fixed and Mode II personal/portable devices operating in the TV bands and instead requires these devices to re-check the white space database at 60-minute intervals to protect licensed wireless microphones. This requirement also applies to the new class of mobile white space device that the Commission established in 2020.

#### **F. Steps Taken to Minimize the Significant Economic Impact on Small Entities, and Significant Alternatives Considered**

The RFA requires an agency to describe any significant, specifically small business, alternatives that it has considered in reaching its proposed approach, which may include the following four alternatives (among others): “(1) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance and reporting requirements under the rule for such small entities; (3) the use of performance rather than design standards; and (4) an exemption from coverage of the rule, or any part thereof, for such small entities.”<sup>154</sup>

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Radiotelephone Service; 6) low power auxiliary services, including wireless microphones; 7) border areas near Canada and Mexico; 8) radio astronomy services; 9) 600 MHz band services; 10) Wireless Medical Telemetry Service (WMTS) on channel 37; and (11) 488-494 MHz band in Hawaii. 47 CFR § 15.712(a)-(k).

<sup>154</sup> See 5 U.S.C. § 603(c)(1) – (c)(4).

The Second Order on Reconsideration eliminates the requirement for white space databases to “push” changes in channel availability to white space devices when a licensed wireless microphone registers to use a previously vacant channel. Instead, white space devices operating on TV channels, where licensed wireless microphones may also operate, must re-check channel availability with the white space database on a more frequent basis – once every 60 minutes rather than once per day. The Commission believes that a requirement for more frequent database checks is easier to implement than a push notification system and will more reliably protect licensed wireless microphones. A more frequent database re-check is not required for white space devices operating in the 600 MHz service bands, the upper portion of the 600 MHz duplex gap, or on channel 37 because licensed wireless microphones do not operate in those bands.

The Second Order on Reconsideration provides a transition period of six months for white space devices being certified, imported, marketed or operated to comply with the more frequent database re-check interval. The re-check interval for a white space device is programmed by software and can generally be changed easily, so a longer transition period is not necessary.

**Report to Congress:** The Commission will send a copy of the Second Order on Reconsideration and Order, including this FRFA, in a report to Congress pursuant to the Congressional Review Act.<sup>155</sup> In addition, the Commission will send a copy of the Second Order on Reconsideration and Order, including this FRFA, to the Chief Counsel for Advocacy of the SBA. A copy of the Second Order on Reconsideration and Order and FRFA (or summaries thereof) will also be published in the Federal Register.<sup>156</sup>

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<sup>155</sup> See 5 U.S.C. § 801(a)(1)(A).

<sup>156</sup> See 5 U.S.C. § 604(b).