

**Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, D.C. 20554**

In the Matter of	)	
	)	
Use of Spectrum Bands Above 24 GHz For Mobile Radio Services	)	GN Docket No. 14-177
	)	
Establishing a More Flexible Framework to Facilitate Satellite Operations in the 27.5-28.35 GHz and 37.5-40 GHz Bands	)	IB Docket No. 15-256
	)	
Petition for Rulemaking of the Fixed Wireless Communications Coalition to Create Service Rules for the 42-43.5 GHz Band	)	RM-11664
	)	
Amendment of Parts 1, 22, 24, 27, 74, 80, 90, 95, and 101 To Establish Uniform License Renewal, Discontinuance of Operation, and Geographic Partitioning and Spectrum Disaggregation Rules and Policies for Certain Wireless Radio Services	)	WT Docket No. 10-112
	)	
Allocation and Designation of Spectrum for Fixed-Satellite Services in the 37.5-38.5 GHz, 40.5-41.5 GHz and 48.2-50.2 GHz Frequency Bands; Allocation of Spectrum to Upgrade Fixed and Mobile Allocations in the 40.5-42.5 GHz Frequency Band; Allocation of Spectrum in the 46.9-47.0 GHz Frequency Band for Wireless Services; and Allocation of Spectrum in the 37.0-38.0 GHz and 40.0-40.5 GHz for Government Operations	)	IB Docket No. 97-95
	)	

**REPLY COMMENTS OF FEDERATED WIRELESS, INC.**

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October 31, 2016

## **EXECUTIVE SUMMARY**

In these reply comments, Federated Wireless, a leader in the development and implementation of spectrum sharing technology that will unlock enormous potential for dynamically sharing spectrum resources: (1) reiterates that incorporating dynamic spectrum access technologies such as Spectrum Access Systems more broadly, beyond implementation in the Citizens Broadband Radio Service, will best serve national spectrum management policy and the Federal Communications Commission's goals in this proceeding; (2) supports commenters such as Google, the Open Technology Institute at New America and Public Knowledge, Microsoft, and the Dynamic Spectrum Alliance that urge the Commission to implement SAS technology in the 24 GHz band; (3) encourages the Commission to continue trying to implement SAS technology to improve use of the 70/80 GHz band; and (4) urges the Commission to disregard unfounded and unsupported assertions that SAS technology is "untested."

The scarcity of our national spectrum resources further underscores the importance of leveraging SAS technologies and the exponential increase in efficiencies they enable. We cannot manufacture more spectrum; we can only maximize the efficiency of our use of the resources we have available to us. In view of that fact, the Commission should without delay apply dynamic sharing technologies to the gigahertz of millimeter wave spectrum identified in this proceeding to ensure that no amount of spectrum goes to waste. In doing so, the Commission can not only take a step toward ensuring continued U.S. leadership in the next generation of wireless technology, but also ensure a global leadership position in the next generation of spectrum management.

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**REPLY COMMENTS OF FEDERATED WIRELESS, INC.**

Federated Wireless, Inc. (“Federated Wireless”), a leader in the development and implementation of spectrum sharing technology that will unlock enormous potential for dynamically sharing spectrum resources, hereby replies to the comments filed in the above-captioned

proceeding.<sup>1</sup> In these reply comments, Federated Wireless: (1) reiterates that incorporating dynamic spectrum access technologies such as Spectrum Access Systems (“SAS”) more broadly, beyond implementation in the Citizens Broadband Radio Service (“CBRS”), will best serve national spectrum management policy and the Federal Communications Commission’s (“Commission”) goals in this proceeding; (2) supports commenters such as Google, the Open Technology Institute at New America and Public Knowledge (“OTI/PK”), Microsoft, and the Dynamic Spectrum Alliance that urge the Commission to implement SAS technology in the 24 GHz band; (3) encourages the Commission to continue trying to implement SAS technology to improve use of the 70/80 GHz band; and (4) urges the Commission to disregard unfounded and unsupported assertions that SAS technology is “untested.”

**I. SAS TECHNOLOGIES PROVIDE A WIDE ARRAY OF BENEFITS AND SHOULD BE APPLIED MORE BROADLY TO THE MILLIMETER WAVE BANDS TO ADDRESS THE LOOMING SPECTRUM CRUNCH.**

SAS technology is able to provide all spectrum users with a reliable, dynamic, scalable platform that protects incumbent and licensed users, facilitates innovative opportunistic uses, and fosters the development of emerging business models, all while drastically improving the efficiency of spectrum utilization in the United States. Throughout the Spectrum Frontiers proceeding, Federated Wireless and numerous other commenters have made plain to the Commission the myriad spectrum management advantages SAS technology can provide in the pursuit of a national policy that ensures widespread, dense utilization of spectrum and supports the development of future spectrum uses.<sup>2</sup> As noted by Facebook, SAS and similar technologies “have the potential to

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<sup>1</sup> See *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services et al.*, GN Docket No. 14-177, IB Docket Nos. 97-95, 15-256, RM-11664, WT Docket No. 10-112, Report and Order and Further Notice of Proposed Rulemaking, FCC 16-89 (2016) (the Report and Order is hereinafter referred to as the “R&O” and the Further Notice of Proposed Rulemaking is referred to as the “FNPRM”).

<sup>2</sup> See, e.g., Comments of Facebook, Inc., GN Docket No. 14-177 *et al.* (filed Sep. 30, 2016) (“Facebook Comments”); Comments of the Open Technology Institute and Public Knowledge, GN Docket No. 14-177 *et al.* (filed Sep. 30, 2016)

maximize spectrum use across a variety of users. The use of sharing technologies could also help to balance the needs of mobile network operators seeking to invest in wide-area network infrastructure as well as the needs of other platforms, all while keeping these bands open to the innovation that is yet to come.”<sup>3</sup>

Sharing technologies include the three-tier framework, administered by a SAS, that was approved for, and is being implemented in, the CBRS. Sharing technologies also more generally include database systems that dynamically allocate spectrum and provide interference protection based on the operational environment and propagation characteristics of the spectrum. A SAS or similar approach to managing sharing in the millimeter wave bands will ensure that spectrum is efficiently allocated among potential uses and users. As observed by the Commission and other commenters, “millimeter wave bands can facilitate extensive frequency reuse in the same geographic area,”<sup>4</sup> and “the relatively short propagation characteristics of the bands above 24 GHz enable significant spectrum reuse, which makes these bands good candidates for sharing.”<sup>5</sup>

Federated Wireless therefore urges the Commission to build on the momentum behind SAS technologies by exploiting these benefits throughout the millimeter wave bands, and in particular in the 24 GHz band, the lower 37 GHz band, and the 70/80 GHz bands. Although not addressed in these reply comments, the Commission also should continue to consider use of SAS technology in

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(“OTI/PK Comments”); Comments of Huawei, GN Docket No. 14-177 *et al.* (filed Sep. 30, 2016) (“Huawei Comments”); Comments of Google, Inc., GN Docket No. 14-177 *et al.* (filed Jan. 28, 2016); Comments of Microsoft Corporation, GN Docket No. 14-177 *et al.* (filed Jan. 28, 2016); Comments of the Open Technology Institute and Public Knowledge, GN Docket No. 14-177 *et al.* (filed Jan. 28, 2016); Comments of the National Cable and Telecommunications Association, GN Docket No. 14-177 *et al.* (filed Jan. 28, 2016); Comments of the Consumer Technology Association, GN Docket No. 14-177 *et al.* (filed Jan. 27, 2016).

<sup>3</sup> Facebook Comments at 6.

<sup>4</sup> *Id.*; see also *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services et al.*, GN Docket No. 14-177, IB Docket Nos. 97-95, 15-256, RM-11664, WT Docket No. 10-112, Notice of Proposed Rulemaking, FCC 15-138, at ¶ 212 (2015) (“NPRM”).

<sup>5</sup> FNPRM at ¶ 473.

the 32 GHz band, and Federated Wireless offers whatever support to accomplish these goals that the Commission might need.

**II. FEDERATED WIRELESS SUPPORTS COMMENTERS SUCH AS GOOGLE, OTI/PK, MICROSOFT, AND THE DYNAMIC SPECTRUM ALLIANCE THAT URGE THE COMMISSION TO IMPLEMENT SAS TECHNOLOGY IN THE 24 GHZ BAND.**

The Commission should give serious consideration to the comments filed by Google, OTI/PK, Microsoft, and the Dynamic Spectrum Alliance, all of whom urge the Commission, along with Federated Wireless, to implement SAS technology in the 24 GHz band in order to make better use of this band. The 24 GHz band should be licensed under a SAS-managed framework such as the Part 96 regime for CBRS, instead of the Part 30 UMFUS rules.<sup>6</sup>

As noted by OTI/PK the 24 GHz band currently is allocated for fixed-satellite service (“FSS”) uplinks (earth-to-space, limited to Broadcast Satellite Service feeder links) and digital Fixed Service. Only five of the band’s 890 licenses are active, occupying a very limited portion of the spectrum. These users would coexist well with priority access and general access users, subject to coordination through a SAS.<sup>7</sup> Google explains that under the control of a SAS, unused spectrum in the 24 GHz band could provide extremely dense deployments of high-bandwidth, gigabit-class connectivity.<sup>8</sup>

Federated Wireless agrees with Google, Microsoft, OTI/PK and the Dynamic Spectrum Alliance that the Commission should authorize three tiers of users at 24 GHz, similar to the Part 96

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<sup>6</sup> See Comments of Google, Inc., GN Docket No. 14-177 *et al.*, at 6-11 (filed Sep. 30, 2016) (“Google Comments”); OTI/PK Comments at 15-16; Comments of the Dynamic Spectrum Alliance, GN Docket No. 14-177 *et al.*, at 3 (filed Sep. 30, 2016) (“DSA Comments”); Comments of Microsoft Corporation, GN Docket No. 14-177 *et al.*, at 11-13 (filed Sep. 30, 2016) (“Microsoft Comments”).

<sup>7</sup> OTI/PK Comments at 15.

<sup>8</sup> Google Comments at 8.

CBRS regime: incumbent users, priority access users, and general authorized access users.<sup>9</sup>

Incumbent users would receive protection from both priority- and general-access operations under a methodology similar to the one the Commission developed to protect FSS earth stations in the CBRS. General-access users would protect priority-access users through spectral and/or spatial separation as directed by a SAS. General-access users would be licensed by rule, and permitted to operate in any spectrum identified by a SAS as available for general-access use. Federated Wireless agrees with Google that spectrum at 24 GHz has different propagation characteristics than CBRS.<sup>10</sup> Thus, precise implementation of a Part 96 framework may be nuanced for the 24 GHz band. The fundamental database-management system, however, would remain the same.

Microsoft agrees with Federated Wireless and Google. Microsoft notes that SAS developers for the CBRS have experience in protecting satellite links, and that experience can be directly applied to protecting satellite links in the 24 GHz band from harmful interference.<sup>11</sup> The Dynamic Spectrum Alliance echoes this point, remarking that there are substantial similarities between the 24 GHz band and the CBRS. In particular, satellite links would be protected in the same manner that they are protected for CBRS.<sup>12</sup> Registered fixed links also would be protected. Federated Wireless agrees, SAS technologies and SAS operators have all the capabilities necessary to accommodate current and future users of the 24 GHz band. In addition, the 700 MHz of spectrum in the 24 GHz band that the Commission proposes to make available for flexible use is significantly less than the amount of spectrum made available in the 28, 37, and 39 GHz bands. The Commission is proposing just three—one unpaired 200 MHz and two unpaired 250 MHz—licenses, and as a result,

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<sup>9</sup> See Google Comments at 8; OTI/PK Comments at 15; DSA Comments at 3; Microsoft Comments at 12.

<sup>10</sup> Google Comments at 8.

<sup>11</sup> Microsoft Comments at 13.

<sup>12</sup> DSA Comments at 3..

the 24 GHz band equipment and device ecosystem under a UMFUS exclusive use regime may be quite limited as the number of licensees and use cases will be constrained by the relatively small amount of spectrum available. In contrast, dynamic, opportunistic shared use under a Part 96 framework will lead to more intensive use, and more varied use cases, which will lead to the development of a larger equipment ecosystem and attending economies of scale. This, in turn, will lower the cost of 24 GHz band equipment and further lower barriers to entry for innovative uses.

The Commission has significant support from Federated Wireless, Google, OTI/PK, Microsoft, and the Dynamic Spectrum Alliance to approve implementing SAS technology and a three-tier sharing framework in the 24 GHz band. A limited amount of this band is presently in use, and through a Part 96 approach, the 24 GHz band can be densely utilized, all while protecting incumbent users.

### **III. A SAS APPROACH TO THE LOWER 37 GHZ BAND WILL MAXIMIZE THE BENEFITS OF THE BIDIRECTIONAL SHARING REGIME.**

Federated Wireless reiterates that a SAS implementation will most effectively and efficiently facilitate the bidirectional sharing regime in the lower 37 GHz band; and would also efficiently administer use-it-or-share-it obligations in the upper 37 GHz band.<sup>13</sup> A SAS implementation designed to effectuate the bidirectional sharing regime under the Part 30 rules is the best—and only—solution to achieve the coordination mechanism set forth by the Commission in the FNPRM.

#### **A. A SAS Implementation Will Best Meet the Commission’s Requirements for the Lower 37 GHz Band Coordination Mechanism.**

The Commission’s framework contemplates a number of coordination mechanism functions for which a SAS implementation is best suited, including: an authorization expiration and construction requirement; prioritized use for Federal users in the lower band segment (“LBS”);

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<sup>13</sup> See Comments of Federated Wireless, Inc., GN Docket No. 14-177 *et al.*, at 7-12 (filed Sep. 30, 2016) (“Federated Wireless Comments”).

interference mitigation in the LBS; and Secondary Market policies in the LBS. The 37 GHz coordination mechanism also “must be able to obtain information about the type of equipment used, the signal contour from the coordinated location, and the bandwidth requested compared with the bandwidth available.”<sup>14</sup> In addition, it must be capable of “regularly updating the status of a coordinated location (on/off or authorized/unauthorized)” and will have to “incorporate this type of information for both Federal and non-Federal fixed and mobile uses.”<sup>15</sup> Together, these elements pose a level of complexity and dynamism that far exceeds the capabilities of more simplistic approaches to implementing bidirectional sharing, such as coordination portals or database management schemes. A SAS is the best and only way forward because, as the Commission has noted, the “advanced capabilities of automated coordination from SAS present advantages over other types of coordination.”<sup>16</sup>

**B. A SAS Implementation Will Seamlessly Effectuate the Use-or-Share Regime in the Upper 37 GHz Band.**

Further, the very existence of the lower 37 GHz band and the band-wide operability mandate make a use-or-share approach feasible and attractive for the 37 GHz band, and such a regime can be best administered by a SAS.<sup>17</sup> Shared Access Licensees (“SALs”) will anchor their use in the LBS while opportunistically accessing the upper band (“UBS”) segment spectrum when it is not in use by a UBS licensee. This SAS-enabled opportunistic access can be implemented by applying the Part 96 use-or-share mechanisms, such as an engineering definition of when UBS licensee spectrum is in use and permitting UBS licensees to self-report protection contours—subject to an objective maximum—to the upper 37 GHz band. Under this SAS-administered use-or-share

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<sup>14</sup> FNPRM at ¶ 449.

<sup>15</sup> *Id.*

<sup>16</sup> *Id.* at ¶ 450.

<sup>17</sup> *See* Federated Wireless Comments at 10-12.

framework, SALs will never be foreclosed from spectrum access, while UBS licensed users are assured that their operations will not be impacted by opportunistic expansions of SAL operations.

As Federated Wireless has previously noted, under a use-or-share obligation, geographic area licensees retain primary rights to their spectrum and, as such, face no possibility of losing their rights, as their commencement of operations necessarily precludes opportunistic users.<sup>18</sup> This allows licensees the operational flexibility to study market developments and design their deployments to meet demand throughout the license term, while also enabling spectrum access for innovative operations by opportunistic users. In contrast, under the current Part 30 scheme, a licensee has exclusive spectrum access for the entirety of the term, with a performance showing due ten years after the license is granted. This creates the possibility that significant portions—if not all—of a licensee’s service area and/or spectrum allocation may go unused for almost the entire license term. Thus, a use- or-share approach is the best means to ensure that upper 37 GHz band spectrum is put to meaningful use at the earliest opportunity, and the Commission should therefore adopt the use-or-share regime in lieu of performance requirements for the licensed UBS.

**C. The Commission Should Engage All 37 GHz Stakeholders to Determine the Best Means of Implementing a Coordination Mechanism for the 37 GHz Band Sharing Regime.**

Just as the CBRS band was an “innovation band,” so too does the 37 GHz band present an opportunity for the Commission to develop new tools to “facilitate more intensive spectrum sharing,” and “dissolve some age-old regulatory divisions between commercial and federal users.”<sup>19</sup> To build on the momentum created by the rapid development of the CBRS and the sharing regimes proposed in the FNPRM, the Commission should stay the course by fully exploring the potential of

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<sup>18</sup> *Id.*

<sup>19</sup> *Amendment of the Commission’s Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, GN Docket No. 12-354, Report and Order and Further Notice of Proposed Rulemaking, FCC 15-47, at ¶ 2 (2015).

bidirectional sharing in the 37 GHz band and the use of advanced coordination and management systems such as a SAS to facilitate such shared use. While Federated Wireless believes that a SAS approach is the best—and only—means to implement a dynamic sharing regime that ensures that lower 37 GHz band spectrum is put to the most efficient uses possible, Federated Wireless recognizes that the characteristics of the band and the bidirectional sharing framework have led other commenters to argue that a different coordination mechanism may be more appropriate. In view of the degree to which millimeter wave spectrum is critical to the U.S. wireless industry's move to 5G and the importance of industry consensus in building the momentum necessary to efficiently launch services on newly available spectrum, Federated Wireless urges the Commission to convene a series of public workshops with the Federal and non-Federal user community, as well as equipment manufacturers and other interested parties, to evaluate and develop the specific mechanism(s) that will most effectively facilitate bidirectional sharing in the band.

#### **IV. FEDERATED WIRELESS ENCOURAGES THE COMMISSION TO CONTINUE TRYING TO IMPLEMENT SAS TECHNOLOGY TO IMPROVE USE OF THE 70/80 GHZ BANDS.**

Federated Wireless agrees with Sony and InterDigital that the Commission should try to implement in the 70/80 GHz bands its proposal for spectrum-sharing that has shown such promise in the CBRS.<sup>20</sup> Although it appears there is some opposition in the docket to the notion of utilizing a SAS for the 70/80 GHz bands at this time, Federated Wireless encourages the Commission to continue evaluating introduction of SAS technology in order to improve spectrum utilization in these bands.

Commenters that are not in favor of implementing SAS technology in the 70/80 GHz bands note that the 70/80 GHz registration regime has been in place for over ten years, and the current

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<sup>20</sup> See Comments of Sony Electronics Inc., GN Docket No. 14-177 *et al.*, at 2-3 (filed Sep. 30, 2016); Comments of InterDigital, Inc., GN Docket No. 14-177 *et al.*, at 5-9 (filed Sep. 30, 2016).

approach has worked well. Today, federal incumbent use in the 70/80 GHz bands is coordinated through a third-party database which coordinates with the National Telecommunications and Information Administration's automated "green light/yellow light" mechanism to determine the potential for harmful interference to federal users.<sup>21</sup> Opponents to using a SAS in the 70/80 GHz bands argue that there is no reason to layer additional, "cumbersome" management of spectrum on top of the current system.<sup>22</sup> Although Federated Wireless understands these views, a sensible plan for transitioning use of the 70/80 GHz band and opening opportunities for making more use of the band, is critical and would not necessarily eliminate or replace the current registration regime. While the existing database management systems may appear sufficient to support coordinated shared use based on current usage of the band, these systems will, in time, result in inefficient use of the 70/80 GHz bands. As such, Federated Wireless encourages the Commission to contemplate a transitional approach in which both the database administration approach is used, for a time, and the SAS is implemented for use over the long term.

**A. SAS Technology is Far More Scalable and Better Able to Coordinate Highly Densified Deployments than Traditional Manual Coordination.**

Google noted in its comments that more than 400 national licensees collectively have registered tens of thousands of links in the bands.<sup>23</sup> Even at those numbers, however, Federated Wireless is of the view that uses in the band are relatively light compared to the amount of spectrum that is available. The database registration system utilized today for the 70/80 GHz bands will not be able to scale to the levels necessary when spectrum sharing in these bands is fully active. Moreover, dynamic shared spectrum access administered by a SAS holds significant advantages over

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<sup>21</sup> See Comments of Wi-Fi Alliance, GN Docket No. 14-177 *et al.*, at 7 (filed Sep. 30, 2016).

<sup>22</sup> *Id.*

<sup>23</sup> Google Comments at 2.

the existing manual coordination processes that some commenters argue should continue to be employed in the 70/80 GHz bands. As the Dynamic Spectrum Alliance points out:

An automated mmW SAS, certified by the Commission and operated by one or more third parties, would best be able to coordinate the greatest degree of spectrum sharing by a variety of users with varying needs for interference protection. Because of the propagation characteristics of the band, the coverage area of a registered device will be very small. Manual coordination through a portal will not scale to handle the sheer quantity of authorizations, or the potential for multiple and overlapping SALs in an area, combinations that could change frequently given the anticipated use cases and short-term nature of the SAL authorizations.<sup>24</sup>

These advantages hold not only in the lower 37 GHz band to which the Dynamic Spectrum Alliance refers,<sup>25</sup> but throughout the millimeter wave bands, including the 70/80 GHz bands. Deployments in these bands are expected to be comprised of many thousands of small cells and microcells operating on a dynamic basis as demands on carrier networks in urban cores vary throughout the course of the workday. It is highly unlikely that manual frequency coordination is capable of handling the volume and complexity of sharing calculations necessary to support such operations, and will be significantly less efficient than a SAS or similar platform.

**B. 70/80 GHz Coordination Databases Are Fully Consistent with a SAS Management Approach and Represent a Natural and Logical Evolution of Coordinated, Shared Use of These Bands.**

Coordinated shared use of the 70/80 GHz band has already evolved with technology, and implementing a SAS to facilitate denser, more dynamic sharing is simply the next step in that evolution. Initially, the band was coordinated through a traditional approach pursuant to which requested links were recorded in the Commission's Universal Licensing System and coordinated with the NTIA through the Interdepartment Radio Advisory Committee process.<sup>26</sup> In 2005, the process became more automated, with the responsibility for coordinating with the NTIA's green

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<sup>24</sup> DSA Comments at 4.

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

<sup>26</sup> FNPRM at ¶ 438.

light/yellow light mechanism to determine the potential for harmful interference shifting to the third-party link registration database managers. As a result, the existing third-party database management systems follow a “SAS-light” approach, whereby the core function of these databases—ensuring that existing uses are not impacted by the commencement of new operations in the same area—is fully consistent with a SAS, but lacks the additional automation or sophistication that a full SAS can provide.

Indeed, the Commission has already acknowledged the advantages that SAS automation holds over traditional manual coordination and the “SAS-light” functionality of the existing databases: “By leveraging the SAS computational power, protections can be tailored to the characteristics of the systems that require protection, different uses with different characteristics can be coordinated in a similar area, and spectrum efficiency can be maximized.”<sup>27</sup> The Commission should exploit these advantages and continue the logical evolution of sharing technologies in the 70/80 GHz band by adopting a SAS approach to shared use.

**C. SASs with Different Capabilities Can Operate in the Same Band, with Different Rights and Responsibilities.**

As use cases and supporting equipment for flexible use of the 70/80 GHz band are developed, the existing third-party databases can remain in place and continue to operate as they do today, registering and coordinating static, fixed point-to-point links. As services that use dynamic beamforming, mobile, and other technologies that complicate the protection calculations necessary to facilitate shared spectrum use and therefore strain the capabilities of the existing databases are developed, those operations would be administered by a SAS. The SAS’s automation and enhanced computational capabilities are far better suited for the dynamic adjustment to protections needed in such a shifting RF environment. Thus, while more complex coordination calculations would be

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<sup>27</sup> *Id.* at 440.

handled by the SAS, the existing databases would be limited to coordinate fixed point-to-point uses only.

This approach is analogous to the CBRS, where the Commission envisioned that a SAS can be deployed with or without an Environmental Sensing Capability (“ESC”) to detect the local RF environment. Those CBRS SASs operating in conjunction with a certified ESC are able to allocate spectrum to devices inside of protection zones around incumbent uses; those that do not use an ESC may not authorize operations within a protection zone. Just as a CBRS SAS operating with an ESC is able to provide more robust spectrum access based on its enhanced picture of the local RF environment, so too could a 70/80 GHz SAS facilitate more complex, dynamic operations than an existing database manager based on its superior computational capabilities and automation. Thus, it is conceivable that a legacy microwave database operator can continue to perform the same functions it always has, while a new entrant operating a SAS can perform the functions necessary to enable the expanded, dynamic, flexible uses envisioned by the Commission in the FNPRM.

**D. PAL Licenses Can Be Defined Based on Current Uses of the 70/80 GHz Bands.**

The Commission observes in the FNPRM that there is a vast amount of spectrum in the 70/80 GHz bands, and relatively light use, leading to the conclusion that the spectrum is essentially the “functional equivalent of a green field.”<sup>28</sup> In view of the huge amount of spectrum available, PALs in the 70/80 GHz band can be defined without impacting incumbent uses or placing additional coordination burdens on the existing database management systems.

As is the case in the CBRS, PALs in the 70/80 GHz bands would not carry pre-defined, static channel assignments, but rather would provide the PAL holder an interference protection right to fixed unit of spectrum. This, in turn, provides the SAS the necessary flexibility to authorize PAL

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<sup>28</sup> *Id.* at ¶ 432.

operations on frequencies that will not impact nearby existing uses, and also to modify the PAL frequency assignments in ways that maximize spectrum utilization.

**E. 70/80 GHz Fixed Links Can Be Authorized by an Existing Database Management System or SAS under a Modified GAA Scheme.**

Under a SAS-administered sharing regime, the GAA tier of the 70/80 GHz bands could be further segmented to allow for both fixed and mobile uses. In such a framework, GAA-fixed users would have a first-in-time right to access spectrum, which would provide fixed users a greater level of certainty with respect to their existing and future links. GAA-mobile users, in contrast, would operate on a basis similar to CBRS GAA users, having no first-in-time right or expectation of interference protection. These GAA-mobile users would be authorized by the SAS, which is best suited to the dynamic interference protection computations necessary to facilitate shared mobile use, and would be obligated to protect the fixed users. Not only would this segmentation of the GAA tier between fixed and mobile uses provide for shared use between the services, but also would allow for the coexistence of the existing coordination databases and SASs by providing fixed users with protection rights vis-à-vis mobile users, which in turn would allow fixed users and the existing link registration databases to continue operating as they do today while a SAS authorizes mobile operations around those existing uses.

**F. The Technical Rules Proposed by the Commission in the FNPRM Can Be Fully Supported in a Band Managed by Both SASs and Legacy Database Systems.**

In adopting a SAS framework for the 70/80 GHz bands, the Commission should incorporate the existing technical rules for fixed uses of the bands into the new licensing framework to ensure compatibility of existing and new systems and management approaches. As existing 70/80 GHz licensees and link registration databases continue to operate in the same manner as they do today, it is imperative that the SAS and the legacy databases refer to the same set of technical standards to ensure that the RF environment is consistently modeled across spectrum management

providers so that spectrum users receive accurate, reliable frequency assignments that avoid interference. The other technical rules proposed in the FNPRM, or those existing under Part 96, will support the 70/80 GHz sharing regime envisioned by the Commission, and can readily be supported and enforced under a SAS implementation.

**G. A SAS in the 70/80 GHz Bands Is Fully Compatible with an Unlicensed “Underlay” Authorization as Some Commenters Propose.**

In their comments, both OTI/PK and Microsoft urge the Commission to create an “underlay” right for Part 15 unlicensed use of the 70/80 GHz bands.<sup>29</sup> Federated Wireless believes that such an underlay right for indoor-only use is not at odds with the Part 96 framework proposed in the FNPRM, and that in fact a SAS administration of the band offers enforcement advantages over pure unlicensed use with respect to such indoor-only operations.

So long as steps are taken to ensure that authorized devices can only be used indoors, such as by protection by requiring that indoor devices operate with AC power only, register their location with the SAS, and provide certain technical specifications, an unlicensed Part 15 underlay is perfectly compatible with a Part 96 licensing regime at 70/80 GHz. To maximize the effectiveness of the sharing regime and ensure protection of incumbent, PAL, and GAA users, unlicensed devices should be required to register autonomously with a SAS, with no need for ongoing spectrum management functions. Such an approach is simple, low cost, and does not present a barrier to unlicensed use of the band. With this registration requirement, the SAS would provide utility in enforcement as it could aid in the detection of rogue Part 15 devices, such as through the device RF signal reporting functions implemented under Part 96.<sup>30</sup>

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<sup>29</sup> See OTI/PK Comments at 19-20; Microsoft Comments at 7-10.

<sup>30</sup> It should be noted that a Part 15 underlay is perhaps less compatible with legacy database approaches and wholly unmanaged unlicensed use of the 70/80 GHz bands likewise offers no recourse in the event of interference to incumbent, PAL, and GAA users.

Although there is some resistance to implementing SAS technology for the 70/80 GHz bands today, Federated Wireless encourages the Commission to persevere and consider an approach to transitioning to a SAS over time. The current manual database registration system has been effective to date, but a more sophisticated system will be needed in order to handle the volume of new uses in these bands that are anticipated.<sup>31</sup>

**V. FEDERATED WIRELESS URGES THE COMMISSION TO DISREGARD UNFOUNDED AND UNSUPPORTED ASSERTIONS THAT SAS TECHNOLOGY IS “UNTESTED.”**

Some commenters object to the application of SAS technology to the millimeter wave bands on the grounds that dynamic spectrum access database technology is “untested” and that introducing such technologies into the millimeter wave bands could delay development and deployment of 5G wireless systems.<sup>32</sup>

To the extent that commenters object to the application of SAS technologies to the mmW bands on the grounds that the technology is “untested,” Federated Wireless reiterates that neither the concept of a dynamic spectrum sharing solution such as a SAS, nor its technological underpinnings—including propagation modeling, sensing, cloud computing, and cognitive radio—could be described as “experimental” or “untested.” These are well known, proven technologies widely used throughout the telecommunications sector, which the SAS combines and leverages to enable a leap forward in spectrum management capabilities.

Moreover, the Commission and CBRS stakeholders have made significant strides toward certifying SAS Administrators and initiating operations in the CBRS. Prospective SAS

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<sup>31</sup> As the SAS will have more capability, and open additional for spectrum allocation and management opportunities for the system administrator, Federated Wireless believes that legacy database operators will be appropriately incented to upgrade their systems for full SAS operation.

<sup>32</sup> See, e.g., Comments of CTIA, GN Docket No. 14-177 *et al.* (filed Sep. 30, 2016); Comments of the Competitive Carriers Association, GN Docket No. 14-177 *et al.* (filed Sep. 30, 2016); Comments of T-Mobile, GN Docket No. 14-177 *et al.* (filed Sep. 30, 2016); Comments of Ericsson, GN Docket No. 14-177 *et al.* (filed Sep. 30, 2016).

Administrators and ESC operators submitted their initial applications on May 15, 2016, providing the Commission and the public with a wealth of detailed information on the functioning and valuable capabilities of these technologies. The Commission will soon initiate testing of conditionally certified SASs, and thereafter will finally certify one or more SASs. All of this paves the way for launch of CBRS operations and providing yet more proof of the efficacy and reliability of SAS technology well before the Spectrum Frontiers proceeding is concluded.

Moreover, the claim that applying SAS or similar technology to the millimeter wave bands could delay development and deployment of 5G systems is unfounded, as the sharing regime of the CBRS will have gone from Commission proposal to commercial operations in approximately four years upon launch in 2017. This clearly demonstrates that shared use and light licensing, administered by a SAS or similar platform, is the fastest and most flexible path to market. Furthermore, these arguments disregard the fact that 5G standards are not even expected until 2020, whereas SAS technology is available now and capable of managing operations in the millimeter wave bands whenever 5G standards are finalized.

Finally, Federated Wireless once again encourages the commenters expressing reservations about the functioning of these technologies to avail themselves of the resources provided by the Spectrum Sharing Committee of the Wireless Innovation Forum (“WINNF”). Many issues related to sharing spectrum between disparate uses have already been identified and resolved through the successful multi-stakeholder process employed by the WINNF, and Federated Wireless expects this process to continue. In Federated Wireless’s view, there are no issues before the WINNF that would forestall the successful implementation and certification of SAS technology in the CBRS or millimeter wave bands, and Federated Wireless looks forward to working with its partners and all millimeter wave spectrum stakeholders in pursuit of these goals.

## VI. CONCLUSION

SAS-enabled dynamic sharing is the best means to ensure the most efficient utilization of our spectrum resources, the scarcity of which led the Commission and industry to identify millimeter wave spectrum for potential flexible use: “As increasing congestion has begun to fill the lower bands and carriers have resorted to smaller and smaller microcells in order to re-use the available spectrum, however, industry is taking another look at the mmW bands.”<sup>33</sup> The scarcity of our national spectrum resources further underscores the importance of leveraging SAS technologies and the exponential increase in efficiencies they enable. We cannot manufacture more spectrum; we can only maximize the efficiency of our use of the resources we have available to us. In view of that fact, the Commission should without delay apply dynamic sharing technologies to the gigahertz of millimeter wave spectrum identified in this proceeding to ensure that no amount of spectrum goes to waste. In doing so, the Commission can not only take a step toward ensuring continued U.S. leadership in the next generation of wireless technology, but also ensure a global leadership position in the next generation of spectrum management.

Federated Wireless commends the Commission for continuing to identify new opportunities to support flexible use of spectrum and for acknowledging the future of spectrum management by proposing to use SAS and similar technologies to facilitate shared access to the millimeter wave bands. Although not addressed in these reply comments, the Commission should continue to consider use of SAS technology in the 32 GHz band, and Federated Wireless offers whatever support to accomplish these goals that the Commission might need. More immediately, Federated Wireless urges the Commission to build on the momentum behind SAS technologies by exploiting

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<sup>33</sup> FNPRM at Appendix E, ¶ 3.

these benefits throughout the millimeter wave bands, and in particular in the 24 GHz band, the lower 37 GHz band, and the 70/80 GHz bands.

Respectfully submitted,

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