

**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
	)	

**COMMENTS OF FEDERATED WIRELESS, INC.**

Kurt Schaubach  
Chief Technology Officer  
Federated Wireless, Inc.  
4301 North Fairfax Drive  
Suite 310  
Arlington, VA 22203

September 30, 2016

## EXECUTIVE SUMMARY

Federated Wireless, an innovator in the field of new spectrum management tools, such as spectrum sensing, cloud computing, dynamic spectrum database technologies, cognitive radio and small cell technology, offers these comments in response to the Commission's proposals in the Spectrum Frontiers FNPRM. Federated Wireless applauds the Commission for its adoption of the Part 96 spectrum sharing framework for the 3.5 GHz band and a Federal-non-Federal sharing framework at 37.0-37.6 GHz, which will leverage the ability of dynamic spectrum sharing technologies to exponentially increase the efficiency of spectrum utilization. Spectrum sharing technologies were first identified by PCAST in 2012. The Commission should fully exploit the capabilities of spectrum sharing technologies to ensure that 5G deployments are as innovative, efficient, flexible, and dense as possible and that the Commission's rules support the development of innovative 5G business cases.

To do so, Federated Wireless urges the Commission to:

- (1) build on the momentum that now exists for dynamic spectrum sharing technologies started in the 3.5 GHz band and the 370.0-37.6 GHz band by applying spectrum sharing more broadly throughout the millimeter wave spectrum;
- (2) adopt a SAS approach to the bidirectional sharing regime in the lower 37 GHz band, which will best ensure spectrum availability to Federal and non-Federal users while also enabling innovative uses of the band;
- (3) adopt its proposal to apply a Part 96 framework to shared flexible use in the 70 and 80 GHz bands; and
- (4) apply a SAS approach to the 32 GHz band, which not only would allow for dynamic sharing between Federal and non-Federal users, but could also enable coexistence between existing and future aeronautical and newly authorized flexible terrestrial uses of the band.

## TABLE OF CONTENTS

	Page
I. THE COMMISSION SHOULD BUILD ON THE MOMENTUM THAT NOW EXISTS FOR DYNAMIC SPECTRUM SHARING TECHNOLOGIES AND APPLY THEM MORE BROADLY THROUGHOUT THE MILLIMETER WAVE SPECTRUM. ....	3
A. The Reliable, Proven Technologies That Underpin SAS Technology Facilitate the Most Efficient Spectrum Sharing Regimes While Ensuring Incumbent and Priority Uses Are Protected. ....	3
B. The Dynamic Nature of SAS Technology Allows it to Respond Rapidly to Technological and Regulatory Developments, Enabling Increased Flexibility for Spectrum Users and the Commission. ....	5
II. THE COMMISSION SHOULD ADOPT A SAS APPROACH TO THE LOWER 37 GHz BAND TO MAXIMIZE THE BENEFITS OF THE BIDIRECTIONAL SHARING REGIME. ....	7
A. A SAS Implementation Will Most Effectively and Efficiently Facilitate the Bidirectional Sharing Regime in the Lower 37 GHz Band. ....	7
B. A SAS Implementation Would Also Efficiently Administer Use It or Share It Obligations in the Upper 37 GHz Band. ....	9
III. THE COMMISSION SHOULD IMPLEMENT A PART 96 SHARING FRAMEWORK IN THE 70 AND 80 GHz BANDS, WHICH WILL BEST ENSURE ROBUST, EFFICIENT SHARING AMONG INCUMBENTS AND NEWLY AUTHORIZED FLEXIBLE USES. ....	12
A. The Commission Should Take Advantage of the Work Already Accomplished at 3.5 GHz and Apply a Part 96 Framework to the 70 and 80 GHz Bands. ....	13
B. A SAS Implementation at 70 and 80 GHz Provides Flexibility for Federal Users to Update and Expand Their Uses as Necessary. ....	14
C. Existing 70 and 80 GHz Licensees and Registered Links Should Be Grandfathered for a Sufficient Amount of Time to Allow for a Transition to the New Service Rules for the Band. ....	15
D. The Commission Should Not Delay Authorization of GAA Operations on a Licensed-by-Rule Basis. ....	15
E. SAS Technology Can Exploit Dynamic Beamforming Antennas to Further Enhance the Density and Efficiency of Spectrum Use in the 70 and 80 GHz Bands. ....	16
F. The Commission Should Authorize Indoor-Only Operations in the 70 and 80 GHz Bands, but on a GAA Basis. ....	17
G. The Commission Should Adopt Consistent Rules for the Entire Band. ....	19

IV.	The Commission Should Authorize Flexible Use in the 32 GHz Band, as SAS Technology Can Facilitate Shared Use Between Existing and Emerging Uses.....	20
V.	CONCLUSION .....	22

**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
	)	

**COMMENTS OF FEDERATED WIRELESS, INC.**

Federated Wireless, Inc. (“Federated Wireless”), an innovator in the field of new spectrum management tools, such as spectrum sensing, cloud computing, dynamic spectrum database technologies, cognitive radio and small cell technology, offers these comments in response to the proposals made by the Federal Communications Commission (“Commission”) in the above-

captioned proceeding.<sup>1</sup> Federated Wireless applauds the Commission for its adoption of the Part 96 spectrum sharing framework for the 3.5 GHz band and a Federal-non-Federal sharing framework at 37.0-37.6 GHz, which will leverage the ability of dynamic spectrum sharing technologies to exponentially increase the efficiency of spectrum utilization. Spectrum sharing technologies were first identified by the President’s Council of Advisors on Science and Technology (“PCAST”) in 2012. The Commission should fully exploit the capabilities of spectrum sharing technologies to ensure that 5G deployments are as innovative, efficient, flexible, and dense as possible and that the Commission’s rules support the development of innovative 5G business cases.

To do so, Federated Wireless urges the Commission to: (1) build on the momentum that now exists for dynamic spectrum sharing technologies started in the 3.5 GHz band and the 370.0-37.6 GHz band by applying spectrum sharing more broadly throughout the millimeter wave spectrum; (2) adopt a Spectrum Access System (“SAS”) approach to the bidirectional sharing regime in the lower 37 GHz band, which will best ensure spectrum availability to Federal and non-Federal users while also enabling innovative uses of the band; (3) adopt its proposal to apply a Part 96 framework to shared flexible use in the 70 and 80 GHz bands; and (4) apply a SAS approach to the 32 GHz band, which not only would allow for dynamic sharing between Federal and non-Federal users, but could also enable coexistence between existing and future aeronautical and newly authorized flexible terrestrial uses of the band.

---

<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 referred to herein as the “R&O” and the Further Notice of Proposed Rulemaking is referred to as the “FNPRM”).

**I. THE COMMISSION SHOULD BUILD ON THE MOMENTUM THAT NOW EXISTS FOR DYNAMIC SPECTRUM SHARING TECHNOLOGIES AND APPLY THEM MORE BROADLY THROUGHOUT THE MILLIMETER WAVE SPECTRUM.**

In view of the scarcity of our national spectrum resource and the need for additional wireless bandwidth to serve the ever-expanding demand for broadband connectivity, Federated Wireless urges the Commission to fully embrace spectrum sensing and SAS technologies as a comprehensive approach to better spectrum management policy. SAS technology, among many other benefits: (1) provides the capability to authorize spatial reuse and sharing of spectrum among incumbents and new users, significantly increasing utilization of high-frequency bands while reliably ensuring protection of incumbent and priority uses; and (2) enables operational and regulatory flexibility that solves the policy and technical challenges for the Commission and industry that naturally occur when redeploying spectrum with incumbent users, while also future-proofing the bands and allowing business cases to develop over time.

**A. The Reliable, Proven Technologies That Underpin SAS Technology Facilitate the Most Efficient Spectrum Sharing Regimes While Ensuring Incumbent and Priority Uses Are Protected.**

As Federated Wireless has previously stated to the Commission,<sup>2</sup> dynamic spectrum sharing technologies, such as a SAS, represent a fusion of well-known, proven technologies widely used throughout the telecommunications sector—including propagation and interference modeling, sensing, cloud computing, spectrum usage databases, and cognitive radio—that are combined to deliver on the promise of spectrum sharing first identified more than four years ago by the PCAST

---

<sup>2</sup> See Comments of Federated Wireless, GN Docket No. 14-177 *et al.*, at 6 (filed Jan. 26, 2016) (“Federated Wireless Comments”) (citing PCAST, Report to the President: Realizing the Full Potential of Government-Held Spectrum to Spur Economic Growth, at vi (rel. July 20, 2012) (“PCAST Report”), available at [http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast\\_spectrum\\_report\\_final\\_july\\_20\\_2012.pdf](http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast_spectrum_report_final_july_20_2012.pdf) (last accessed Sep. 22, 2016)); Reply Comments of Federated Wireless, GN Docket No. 14-177 *et al.*, at 7 (filed Feb. 26, 2016) (“Federated Wireless Reply Comments”).

Report. The PCAST Report noted that these technologies could increase the effective capacity of Federal spectrum by a factor of 1,000. The Commission has advanced this goal by creating the Citizens Broadband Radio Service in the 3.5 GHz band, which balances incumbent protection, licensed spectrum access, and dynamic, opportunistic spectrum access through the use of a SAS-enabled three-tier sharing regime. The Commission is now working with its partners at the Department of Defense (“DoD”) and the National Telecommunications and Information Administration (“NTIA”), to award conditional and final approval to SAS administrators, which will allow the launch of commercial services on shared spectrum in the 3.5 GHz band. These approvals by the Commission, DoD, and NTIA should leave no doubt that SAS technology is proven, reliable, and capable of facilitating dynamic sharing between and among Federal and non-Federal users in a way that maximizes the efficiency of spectrum utilization. These capabilities are not in any way limited to the 3.5 GHz band and are, in fact, wholly transportable to the millimeter wave spectrum at issue in this proceeding. In fact, given advances in dynamic beamforming antennas and the likelihood that many millimeter wave transmissions will be highly directional, a SAS that is authorized to allocate not only frequencies and power levels, but also directivity, to base stations under its administration will enable even denser, more efficient use of valuable high-band spectrum while continuing to provide highly reliable interference protection to incumbent and higher priority systems.

Dynamic spectrum access technologies such as a SAS can and will simultaneously protect incumbent operations from interference generated by newly authorized mobile operations and authorize those new operations in a way that brings significant swaths of spectrum to a market with ever-growing bandwidth demands. Given the significant presence of incumbent operations in the bands above 24 GHz, the use of a dynamic spectrum access tool to manage incumbent interference protection and authorize new mobile operations would best balance the interests of these two user

groups and accomplish the Commission's goals in this proceeding of making more efficient use of bands above 24 GHz. In addition, the propagation and spectral reuse characteristics of the bands above 24 GHz make them especially well-suited to more active spectrum management that can be administered by a SAS. There is every reason why spectrum sensing and sharing advances should be made available in the bands above 24 GHz, just as in the 3.5 GHz band.

**B. The Dynamic Nature of SAS Technology Allows it to Respond Rapidly to Technological and Regulatory Developments, Enabling Increased Flexibility for Spectrum Users and the Commission.**

SAS technology enables the Commission to provide for flexible, shared use between incumbents and emerging new use cases by exploiting the fact that the SAS is highly scalable and able to rapidly adapt to new uses. The SAS can dynamically adjusting spectrum allocations, power limits, and other operational parameters to ensure protection to incumbents and spectrum access for new entrants. As Federated Wireless has noted, a flexible sharing framework, which imposes a minimal set of common technical standards and employs a SAS to manage disparate uses and technologies, provides regulatory and technological flexibility that allows use cases to develop over time. A flexible sharing framework eliminates the need for the Commission to engage in lengthy rulemaking proceedings to adopt service rules for each band based, in the best-case scenario, on educated guesswork at how technology and business cases will develop.<sup>3</sup> When SAS technology is deployed in a band, the rules implemented by a SAS can change to match evolving technologies and use cases, adjusting the administration of the band in response to business, technological, and regulatory developments and optimizing the efficiency of spectrum utilization and the Commission's oversight of operations in the band. Furthermore, as the tools employed by a SAS improve, such as

---

<sup>3</sup> See Federated Wireless Comments at 10.

with more accurate propagation models or radio environment sensors, all of the SAS-managed devices will benefit from the resulting gains in spectrum efficiency and access.

SAS technology also solves the problem of how to provide for shared, opportunistic access to spectrum while dynamically implementing protections for incumbent or priority users as their operations change, both from moment to moment and as future systems evolve. For example, the SAS in the 3.5 GHz band dynamically protects shipborne radar operations as they near the coastline by reallocating non-Federal users to different frequencies. Similarly, the SAS responds to changes in priority commercial licensees' operations by altering the licensee's protected contour and the areas in which opportunistic access is available. Likewise, a SAS could perform the same functions in the millimeter wave bands above 24 GHz by dynamically responding to changes in a licensee's operations, protecting airborne radar operations as aircraft traverse license areas, enabling sharing among Federal and non-Federal users, and providing Federal users the ability to access spectrum on a priority basis to support expanded or emerging uses as they continue to develop. A SAS is also able to enforce the service rules governing a particular band and address interference to incumbent or priority user operations through its administration of the base stations operating in the band and its ability to process interference reports. When a SAS receives an interference report from an incumbent or priority user, it will identify the offending base station(s) and order the offending base station to modify its operations or cease transmissions to remedy the interference event.

In view of the broad applicability of SAS technology to spectrum management in the millimeter wave bands and the obvious benefits to spectral use efficiencies, regulatory flexibility, and spectrum availability to support innovative new use cases, Federated Wireless urges the Commission to not only adopt its proposals to take advantage of dynamic spectrum access technology in the lower 37 GHz band and the 70 and 80 GHz bands, but to exploit these capabilities throughout the millimeter wave spectrum.

## **II. THE COMMISSION SHOULD ADOPT A SAS APPROACH TO THE LOWER 37 GHz BAND TO MAXIMIZE THE BENEFITS OF THE BIDIRECTIONAL SHARING REGIME.**

Federated Wireless applauds the Commission’s decision to allocate the 600 MHz at 37.0-37.6 GHz for coequal sharing among Federal and non-Federal fixed and mobile users.<sup>4</sup> To effectuate this sharing regime, the Commission notes that a coordination mechanism is needed and that “it 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>5</sup> In addition, the coordination mechanism must also 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>6</sup> In view of these requirements, and the additional regulatory flexibility and efficiency that a SAS can enable, Federated Wireless urges the Commission to adopt a SAS implementation to facilitate both the bidirectional sharing regime in the lower 37 GHz band and the “use it or share it” framework in the upper 37 GHz band.

### **A. A SAS Implementation Will Most Effectively and Efficiently Facilitate the Bidirectional Sharing Regime in the Lower 37 GHz Band.**

As noted above, the “advanced capabilities of automated coordination from SAS present advantages over other types of coordination.”<sup>7</sup> The automated nature of SAS administration in a sharing regime allows the SAS to account for the type of equipment and air interface used, the signal contour from both the coordinated and the requested location, and the bandwidth requested

---

<sup>4</sup> R&O at ¶ 111.

<sup>5</sup> FNPRM at ¶ 449.

<sup>6</sup> *Id.*

<sup>7</sup> *Id.* at ¶ 450.

compared with the bandwidth available, all while factoring in the local spectrum environment in real time. As a result, a SAS implementation is significantly more efficient and flexible than traditional static, manual frequency coordination, and its advanced capabilities enable more complex regulatory regimes that support innovative and opportunistic access to spectrum resources while also protecting incumbent and priority uses.

The dynamic allocation capabilities of a SAS will allow both Shared Access Licensees (“SALs”) and Federal users in the lower 37 GHz band to access needed spectrum—up to the entire 600 MHz, if available—nearly immediately, thus allowing licensees to scale on short notice to support short-term operations requiring greater bandwidth. This dynamic allocation capability also enables the SAS to easily and efficiently provide Federal users with priority access to lower 37 GHz band spectrum when needed, without requiring a set-aside that would artificially constrain the spectrum available to non-Federal users even when there are no priority Federal operations ongoing in a particular area. Similar to a Federal user detection event in the 3.5 GHz band, a SAS administering the lower 37 GHz sharing regime could dynamically make spectrum available on a priority basis when needed to support critical Federal operations, even when the entire band is in use, by reconfiguring the channels in use by other operators or by clearing the necessary channel size.<sup>8</sup> The SAS is also able to preserve the operational security of Federal operations when dynamically allocating spectrum, such as by sharing a defined contour of use—similar to a Pal Protection Area (“PPA”) in the 3.5 GHz band—provided by a Federal user or Federal intermediary without exposing Federal system specifics.

---

<sup>8</sup> *Id.* at ¶ 457.

Similarly, a SAS is able to quickly address interference issues in the band through its administration of the local spectrum environment and its ability to process interference reports, and can direct offending base stations to alter or cease operations to resolve the interference event. In the event of critical Federal operations requiring certainty that no harmful interference will occur from other users in the shared band, a SAS is capable of implementing a Protection Zone around the area of the critical transmissions or could implement an area-like aggregate interference protection as used in PPAs. The SAS then ensures that co-channel and adjacent-channel transmissions are prohibited or limited in these areas to ensure interference-free operation for critical Federal purposes.

Federated Wireless recognizes that a coequal, bidirectional sharing regime raises questions as to how competing spectrum requests from co-primary users of the lower 37 GHz band will be resolved. It is crucial that, in conjunction with the Commission, Federal and non-Federal stakeholders in the lower 37 GHz band work to develop, implement, and—as uses and technologies evolve over time—adopt consensus mechanisms to govern the allocation of spectrum and resolution of competing requests in the band. Federated Wireless looks forward to working with the Commission and stakeholders to ensure such mechanisms maximize the efficiency and utility of the band, and provide the spectrum access needed to support use of the band by all users.

**B. A SAS Implementation Would Also Efficiently Administer Use It or Share It Obligations in the Upper 37 GHz Band.**

In addition to the advantages of leveraging SAS technology to administer the bidirectional sharing regime in the lower 37 GHz band, a SAS implementation could also best facilitate the “use it

or share it” obligations proposed for the upper 37 GHz band.<sup>9</sup> Just as the Part 96 framework in the 3.5 GHz band leverages the SAS’s spectrum allocation capabilities in conjunction with a band-wide operability requirement to enable opportunistic use and dynamic adjustments as priority users deploy in new locations and on new frequencies, so too could a SAS administer a “use or share” regime in the 37 GHz band. Given the operability requirement for equipment across the 37 and 39 GHz bands, a SAS could permit lower 37 GHz SAL or Federal users, as well as other licensees holding authorizations in the upper 37 GHz band, to opportunistically expand their operations into unused upper 37 GHz band spectrum. Similar to the 3.5 GHz band, as upper 37 GHz licensees deploy, those licensees could self-report protection contours—subject to an objective maximum—for those deployments. The SAS would then factor the protection contour into its allocation processes to ensure opportunistic users are no longer able to access co-channel frequencies inside the licensee’s protection contour and opportunistic usage outside the contour is managed to limit interference to systems within the contour.

This responsiveness would also enable immediate opportunistic use of the upper 37 GHz band spectrum while auctions are conducted and licensees plan and execute their deployments. With the SAS providing guaranteed access to the licensed spectrum as the licensee ramps up its deployment, there is no reason to withhold opportunistic access to unused upper 37 GHz band spectrum for an arbitrary period of time. Instead, as licensees purchase spectrum rights and plan their deployments, the Commission should allow for innovative, opportunistic uses to develop on unused spectrum and exploit SAS technology to ensure interference-free operations as the licensees eventually begin to deploy.

---

<sup>9</sup> *Id.* at ¶¶ 460-64. Federated Wireless also supports adoption of a “use or share” regime in the 28 and 39 GHz bands, which would similarly enable opportunistic, innovative access to spectrum not in use by licensees in those bands. *See id.* at ¶ 474.

The FNPRM also seeks comment on whether, with respect to UMFUS geographic area licensees in the upper 37 GHz, 28 GHz, or 39 GHz bands, a “use or share” obligation should be imposed “in addition to, or in lieu of, meeting specific construction requirements” under section 30.105.<sup>10</sup> As Federated Wireless and other commenters have previously explained, a “use or share” framework creates incentives, and provides opportunities, for investment and innovation in the shared spectrum by both licensees and opportunistic users.<sup>11</sup> Federated Wireless agrees with the Open Technology Institute and Public Knowledge that “a robust ‘use-or-share’ obligation on licensees would accomplish a number of objectives, including more intensive use of fallow spectrum capacity, lowering barriers of entry to diverse uses and users, and providing added incentives for licensees to construct and operate facilities.”<sup>12</sup> Under a “use or share” obligation, geographic area licensees retain primary rights to their spectrum and, as such, face no possibility of loss of rights, as their commencement of operations necessarily precludes opportunistic users. 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.

---

<sup>10</sup> *Id.* at ¶ 474.

<sup>11</sup> See Federated Wireless Comments at 8-15; Reply Comments of Federated Wireless, Inc., GN Docket No. 14-177 *et al.*, at 5 (filed Feb. 25, 2016); Comments of the Open Technology Institute and Public Knowledge, GN Docket No. 14-177 *et al.*, at 6 (filed Jan. 28, 2016) (“OTI/PK Comments”); Comments of the National Cable and Telecommunications Association, GN Docket No. 14-177 *et al.*, at 10 (filed Jan. 28, 2016).

<sup>12</sup> OTI/PK Comments at 6.

Given the obvious advantages over a traditional performance benchmark met at the ten-year mark, a “use or share” framework best strikes “the appropriate balance between providing licensees with operational flexibility and ensuring that spectrum does not lie fallow.”<sup>13</sup> Similarly, given the incentive structure created by a “use or share” obligation, such a regime also provides the best means for the Commission to meet its statutory obligation to prevent spectrum warehousing and incent investment in and rapid deployment of new technologies and services.<sup>14</sup> Federated Wireless thus urges the Commission to adopt the “use or share” obligation in the upper 37 GHz band, as well as the 28 GHz and 39 GHz bands, in lieu of traditional performance requirements met by buildout showings at license renewal.

**III. THE COMMISSION SHOULD IMPLEMENT A PART 96 SHARING FRAMEWORK IN THE 70 AND 80 GHz BANDS, WHICH WILL BEST ENSURE ROBUST, EFFICIENT SHARING AMONG INCUMBENTS AND NEWLY AUTHORIZED FLEXIBLE USES.**

In the FNPRM, the Commission proposes to adopt a three-tier sharing framework for the 70 and 80 GHz bands, including the protection of incumbent users, authorization and protection of a Priority Access tier of users, and authorization and coordination of a General Authorized Access (“GAA”) tier of users.<sup>15</sup> Federated Wireless fully supports this proposal, and urges the Commission to adopt it in order to unlock the benefits of dynamic spectrum sharing in the 70 and 80 GHz bands. As further described below, in creating the Part 96 framework to facilitate dynamic sharing among disparate uses, the Commission has already implemented solutions to the challenges posed by, for example, sharing between Federal and non-Federal users, protection and grandfathering of varying incumbent uses at thousands of registered sites, and defining the necessary functionalities

---

<sup>13</sup> R&O at ¶ 191.

<sup>14</sup> *See id.* at ¶ 196; *see also* 47 U.S.C. § 309(j)(4)(B).

<sup>15</sup> FNPRM at ¶ 440.

for a SAS to administer such a sharing regime. As a result, Federated Wireless urges the Commission to exploit the work already done at 3.5 GHz and apply the Part 96 framework to the 70 and 80 GHz bands to most efficiently and effectively implement the proposed sharing regime.

**A. The Commission Should Take Advantage of the Work Already Accomplished at 3.5 GHz and Apply a Part 96 Framework to the 70 and 80 GHz Bands.**

Federated Wireless encourages the Commission to apply the Part 96 framework to the 70 and 80 GHz bands. The Part 96 rules have already established operational parameters for the SAS, Priority Access licensees, and GAA users, as well as the relevant information to be provided to the SAS to allow it to facilitate a three-tiered sharing framework.<sup>16</sup> Many of the items on which the Commission raises questions, including protection methodology, geographic reporting and position resolution requirements, measurement reporting, and required SAS functionalities, have been thoroughly examined at 3.5 GHz and could be readily adapted for application in the 70 and 80 GHz bands, subject to certain band- and service-specific adjustments. There is thus no reason for the Commission to recreate from whole cloth a three-tiered sharing regime for the 70 and 80 GHz bands. Instead, importing this framework, subject to certain changes in the technical rules to account for the difference in incumbent services, the types of operations to be conducted under new flexible use rules, and the differences in the propagation characteristics of the 70 and 80 GHz bands will allow the Commission to efficiently build on the solid foundation of rules needed to effectuate a dynamic spectrum sharing regime established at 3.5 GHz while adopting a regulatory regime tailored to the unique attributes of the 70 and 80 GHz bands.

Moreover, the proposals in the FNPRM, particularly with regard to the required SAS functionalities, closely track the requirements imposed in Part 96 of the Commission's rules.

---

<sup>16</sup> See 47 C.F.R. § 96.1 *et seq.*

Adopting these proposals would greatly simplify the process of evaluating and certifying applicants to serve as SAS administrators in the 70 and 80 GHz band, including by recertifying existing 3.5 GHz SAS administrators provided that they demonstrate compliance with any additional requirements imposed for these bands. To the extent there are additional or different rules adopted for the 70 and 80 GHz bands—for example, propagation modeling or protection criteria—the SAS could readily input these requirements into its calculations while operating under the more general Part 96 framework, just as it can readily adapt to regulatory and technological developments in any band, as noted in Section I above.

In addition, the Wireless Innovation Forum—a cross-industry consensus group comprised of stakeholders in the 3.5 GHz band—has already developed a number of standards and protocols to effectuate Part 96 regulations, including SAS-SAS communication, SAS-base station communication, information security, and information sharing and data privacy that could be readily transported, subject to band-specific modifications, to the 70 and 80 GHz bands.

**B. A SAS Implementation at 70 and 80 GHz Provides Flexibility for Federal Users to Update and Expand Their Uses as Necessary.**

Use of a Part 96 framework administered by a SAS in the 70 and 80 GHz band would allow Federal users to add new sites and otherwise expand their operations when the need arises. If and when a Federal user needs to expand its operations at a site or to add a new site, the SAS could quickly incorporate the expanded operations or new site and protected contour into its calculations and alter the authorized operating parameters for other 70 and 80 GHz users, thereby ensuring that critical Federal operations are able to access the spectrum needed in the future.

**C. Existing 70 and 80 GHz Licensees and Registered Links Should Be Grandfathered for a Sufficient Amount of Time to Allow for a Transition to the New Service Rules for the Band.**

Federated Wireless encourages the Commission to grandfather existing 70 and 80 GHz licensees and registered links for some period of time to enable them to transition to the new service rules. Doing so encourages these licensees to refresh their technology and will improve the efficiency of spectrum use in the 70 and 80 GHz bands by not requiring Priority Access and GAA users to coordinate their operations to accommodate less advanced, less efficient legacy radios. To allow these licensees sufficient time to conduct this transition, the Commission should grandfather their existing operations on registered links until the later of the expiration of the current license term or five years from the adoption date of an Order implementing a Part 96 framework. The Commission's reasons for implementing a five-year grandfathering period for existing wireless broadband licensees in the 3.5 GHz band apply equally here, as "according them more than a five-year priority over GAA users of the band would unnecessarily curtail the spectral efficiencies contemplated by our rules."<sup>17</sup>

**D. The Commission Should Not Delay Authorization of GAA Operations on a Licensed-by-Rule Basis.**

The FNPRM asks whether GAA operations in the 70 and 80 GHz bands should be licensed by rule or subject to a "licensed light" regime like that currently in place for the band. In keeping with the suggestion that the Commission take advantage of its work at 3.5 GHz by applying a Part 96 framework to the 70 and 80 GHz bands, Federated Wireless suggests that GAA operations be authorized by rule. Under a Part 96 regime, base stations would be required to register with a SAS, including geolocation information, before commencing transmissions at power levels and on

---

<sup>17</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 Notice of Proposed Rulemaking, FCC 15-47, at ¶ 400 (2015).

frequencies dictated by the SAS. In view of the Part 96 registration requirement, there is no need to also adopt the “licensed light” requirement that users first obtain nationwide licenses and subsequently register individual sites, as each licensed-by-rule base station would already be registered before requesting a spectrum grant and commencing operations.

Federated Wireless also urges the Commission not to defer authorizing GAA operations until the conclusion of the first Priority Access license term. A SAS could administer GAA operations in the 70 and 80 GHz band as soon as it is certified and equipment for the band is authorized, while incorporating new Priority Access operations and protection contours into its calculations as Priority Access licensees ramp up deployment. Given the ability of the SAS to ensure that Priority Access operations will be protected from interference as deployment densifies, there is no reason to forestall opportunistic access to spectrum by GAA users to support innovative use cases.

**E. SAS Technology Can Exploit Dynamic Beamforming Antennas to Further Enhance the Density and Efficiency of Spectrum Use in the 70 and 80 GHz Bands.**

In adopting a Part 96 framework for shared use at 70 and 80 GHz, Federated Wireless urges the Commission to allow the SAS to dictate not only the frequency and power level used by base stations, but also to limit the directionality of transmissions by dynamic beamforming antennas to maximize the efficiency of spectrum use in the band. In the 3.5 GHz band, the SAS takes into account antenna beam pattern, height, orientation, and siting information when determining the allowable operational parameters for base stations under its administration. Thus, providing a SAS the authority to not only consider this information, but also specifying to a base station which particular wedges of its possible beam patterns cannot be used is simply an incremental step on existing SAS technology that further enhances the efficiency of operations and allows for denser

deployments. This would then enable devices of new entrants to operate closer to protected incumbents as harmful beam patterns would be excluded. Devices incapable of providing required information or of executing instructions that limit directivity would have to be managed under worst case assumptions about directivity.

To maximize this effect, Federated Wireless suggests that the Commission adopt its proposal to require Class A professional installers and Class B base stations in the 70 and 80 GHz bands to provide orientation information upon registering with the SAS, which would then allow the SAS to most efficiently allocate frequencies, power levels, and directivity of transmissions in the band.<sup>18</sup> Absent such a requirement, or when authorizing the operations of a base station that does not support dynamic beamforming, the SAS would be forced to use worst-case assumptions based on only frequency and power level in administering the spectrum environment in the area of that base station.

**F. The Commission Should Authorize Indoor-Only Operations in the 70 and 80 GHz Bands, but on a GAA Basis.**

In the FNPRM, the Commission seeks comment on whether it should authorize indoor-only operations in the 70 and 80 GHz bands and, if so, whether it should do so on an unlicensed or GAA basis.<sup>19</sup> Federated Wireless supports the authorization of sharing between indoor and outdoor operations in the bands, and encourages the Commission to enable this sharing by employing the existing Part 96 framework and obligating GAA operations, whether indoor or outdoor, to comply with the obligation to protect higher-tier incumbent and Priority Access users. Regardless of whether a GAA operator has deployed indoor or outdoor, the SAS is able to model protections such

---

<sup>18</sup> FNPRM at ¶ 440.

<sup>19</sup> *Id.*

that incumbent and Priority Access tier users are assured of interference-free operations, whether the sharing is between outdoor GAA uses and outdoor Priority Access uses, indoor GAA users and outdoor Priority Access users, or outdoor GAA and indoor Priority Access uses. Applying the existing GAA protection obligations to indoor-outdoor sharing would provide for increased traceability of all GAA operations—whether indoor or outdoor—should there be any interference to incumbent or Priority Access users, and would allow the SAS to order a GAA radio to alter or cease operations directly rather than attempting to reach a control point contact or identify an unlicensed user.

However, in recognition of the greater indoor-to-outdoor propagation losses in the 70 and 80 GHz bands, the specific Part 96 restrictions on GAA use in and around a PPA should be modified as follows. First, a GAA device should be allowed to operate at locations inside of a PPA subject to indoor operation and SAS-enforced protection of PA operations. Second, SAS-enforced GAA protections for indoor GAA use should be to registered PA devices rather than over an entire PPA area.

Federated Wireless urges the Commission to authorize indoor-outdoor sharing under a Part 96 framework with specific protections modified to reflect propagation conditions unique to 70 and 80 GHz and leverage the SAS's capabilities to enable such sharing, and not to authorize unmanaged, unlicensed operations in the band. Such unlicensed devices could be inadvertently deployed outdoors, or deployed near windows such that they more closely resemble outdoor systems, which could lead to harmful interference to higher-tier 70 and 80 GHz users and would significantly increase the difficulty of resolving interference events. However, in the event the Commission elects to adopt an unlicensed approach to indoor 70 and 80 GHz operations, Federated Wireless supports a hybrid approach that would combine complementary aspects of the GAA framework and

the technical rules for unlicensed operations in the 92-95 GHz band. This approach would provide assurances of protection by requiring that indoor devices operate with AC power only and that they register their location with the SAS and provide certain technical specifications to allow for greater traceability in the event of interference to other users of the band.

**G. The Commission Should Adopt Consistent Rules for the Entire Band.**

In the FNPRM, the Commission proposes to “extend the same requirements and privileges to all parts of the United States,” but seeks comment on the alternative of adopting a separate regime to govern flexible use of the 70 and 80 GHz bands in the 16 counties that are heavily registered with existing links.<sup>20</sup> Federated Wireless supports the proposal to implement a consistent set of rules for the band throughout the country.

In view of the SAS’s capability to administer and protect disparate uses in densely deployed environments, there is no reason to carve out these 16 counties for differential treatment under the Commission’s rules. Instead, given technical rules and SAS protection requirements appropriate to the propagation characteristics and the types of operations in the band, the SAS will simply implement the sharing regime adopted by the Commission and transparently direct devices under its administration to operate in compliance with that regime. Furthermore, if the SAS is also allowed to provide directivity constraints along with frequency and power grants to managed devices, significantly more devices can be packed into these 16 counties using the framework proposed in the FNPRM.

---

<sup>20</sup> *Id.*

#### **IV. The Commission Should Authorize Flexible Use in the 32 GHz Band, as SAS Technology Can Facilitate Shared Use Between Existing and Emerging Uses.**

In the FNPRM, the Commission proposes to add primary fixed and mobile allocations to the 31.8-33.4 GHz band (“32 GHz band”), and seeks comment on the compatibility of fixed and mobile services with existing Federal and Non-Federal radionavigation, Space Research Service (“SRS”), and Inter-Satellite Service (“ISS”) allocations in the band.<sup>21</sup> Federated Wireless supports the proposal to authorize flexible use in the band, and encourages the Commission to take advantage of SAS technology to coordinate operations and appropriately protect incumbent uses.

A SAS implementation at 32 GHz would enable dynamic shared use of the band between Federal and non-Federal radionavigation users and newly authorized commercial operations, much as the SAS enables dynamic shared use of the 3.5 GHz spectrum previously reserved exclusively for Federal shipborne radars. Just as it does in the 3.5 GHz band, the SAS could allow for commercial use of the spectrum while protecting the incumbent uses and, in the case of Federal operations, preserving operational security by obfuscating the time and location of Federal transmissions. In addition, the SAS could easily protect SRS operations in Goldstone, California, by limiting the power of emissions into a reasonably determined Protection Zone around the site. Because it enables technology and business model flexibility, we believe that the three tier model should also be adopted in this band, with existing incumbents provided the highest tier of protection. Future non-Federal radionavigation uses would comprise the next tier of protection, which would be protected against interference from the third tier, made up of commercial fixed and mobile uses of the band. As noted in Section II.A, co-primary bidirectional sharing raises questions on how to resolve competing uses at the same priority level (e.g., among tier one users), which we believe should be

---

<sup>21</sup> *Id.* at ¶ 392.

addressed by the relevant stakeholders to develop, implement, and adopt consensus mechanisms to govern the allocation of spectrum and resolution of competing requests. One approach that should be considered is to adopt a spectrum market or auction mechanism, but with potentially much shorter timescales (minutes to hours) reflective of the temporary usage by an airborne node. In such a scenario, no market or auction mechanism should be required for tier one users when there are not competing claims to the same spectrum.

A SAS framework at 32 GHz would also facilitate sharing between terrestrial uses and aeronautical radars of the type Echodyne describes for use in Unmanned Aerial Systems (“UAS”).<sup>22</sup> When combined with registration of terrestrial base stations and SAS administration of the operations, geolocation, flightpath, or flight area information on UAS could be incorporated into the SAS’s administration of terrestrial operations to ensure that airborne radars are sufficiently protected from potential interference. In this regime, greater spectrum efficiencies would be gained as more precise localization data for UAS operations are provided to the SAS. When such information is more sensitive, then larger protection areas could be defined. The appropriate levels of protection for these radars should be developed through a consensus multi-stakeholder group, similar to the Wireless Innovation Forum, which has successfully developed a number of standards and protocols for use in the 3.5 GHz band. Federated Wireless looks forward to working with the UAS community to determine the best means of balancing the need for spectrum to support detect-and-avoid radar operations with the need to make spectrum available for flexible terrestrial use to accommodate the explosion in demand for wireless bandwidth.

---

<sup>22</sup> *Id.* at ¶ 391.

## V. CONCLUSION

In view of the many ways in which the dynamic spectrum sharing technologies adopted in the 3.5 GHz band are directly transportable to the millimeter wave spectrum, the Commission should not only apply a SAS framework to the bidirectional sharing regime in the lower 37 GHz band and adopt its proposal to employ SAS technology in the 70 and 80 GHz bands, but it also should immediately begin leveraging the flexibility and efficiency enabled by these technologies throughout the millimeter wave bands. Federated Wireless stands ready to assist the Commission in bringing to bear the well-established and game-changing benefits of spectrum sharing technologies at the frontiers of wireless operations and spectrum management.

Respectfully submitted,

/s/ Kurt Schaubach

Kurt Schaubach  
Chief Technology Officer  
Federated Wireless, Inc.  
4301 North Fairfax Drive  
Suite 310  
Arlington, VA 22203

September 30, 2016