Before the
Federal Communications Commission
Washington DC 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 THE FIXED WIRELESS COMMUNICATIONS COALITION

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COMMENTS OF THE
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The Fixed Wireless Communications Coalition, Inc. (FWCC)[1] files these comments in

[1] The FWCC is a coalition of companies, associations, and individuals actively involved in the fixed services—*i.e.*, terrestrial fixed microwave communications. Our membership includes manufacturers of microwave equipment, fixed microwave engineering firms, licensees of terrestrial fixed microwave systems and their associations, and communications service providers and their associations. The membership also includes railroads, public utilities,

response to the Report and Order and Further Notice of Proposed Rulemaking in the above–referenced dockets.[2]

A. SUMMARY

In the 24, 32, and 50 GHz bands, we support the Commission's proposals to combine fixed and mobile operation under the new Part 30 Upper Microwave Flexible Use Service (UMFUS).

The 42 GHz band (42–42.5 GHz) band is too narrow for duplex fixed operation, and will be narrower still if the Commission provides a guard band to protect adjacent radio astronomy. An UMFUS authorization here will effectively be for mobile use only. But the adjacent band at 42.5–43.5 GHz is unsuitable for mobile use because of its importance to radio astronomy. The best overall solution is to combine 42–42.5 and 42.5–43.5 GHz into a single band with rules for fixed operation. This will use the frequencies efficiently and avoid all harmful interference to radio astronomy.

In the 47 GHz band, we oppose the adoption of rules that would rely on a Spectrum Access System (SAS) for sharing between UMFUS and fixed satellite service (FSS) user terminals, until SAS technology has been proven in the field. The very slow rollout of SAS's much simpler predecessor technology—the TV white space database, which itself has not yet been tested with mobile devices in commercial use—raises doubts about the wisdom of locking

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petroleum and pipeline entities, public safety agencies, cable TV providers, backhaul providers, and/or their respective associations, communications carriers, and telecommunications attorneys and engineers. Our members build, install, and use both licensed and unlicensed point-to-point, point–to–multipoint, and other fixed wireless systems, in frequency bands from 900 MHz to 95 GHz. For more information, see www.fwcc.us.

[2] *Use of Spectrum Bands Above 24 GHz for Mobile Radio Services*, GN Docket No. 14-177 *et al*., Report and Order and Further Notice of Proposed Rulemaking, FCC 16-89 (released July 14, 2016) (*Further Notice*).

in rules now that make interference protection turn on SAS. The *Further Notice* does not spell out the alternative of a first-come, first-served database in enough detail for us to evaluate it. By elimination, we cautiously favor the Commission's third option of giving UMFUS and FSS priority in different segments of the band.

We support limited unlicensed operation at 57–71 GHz aboard aircraft at power levels suitable for a 30–60 cm range while avoiding the first WiGig channel, but only if our colleagues in the earth exploration-satellite service (EESS) conclude their satellites will have adequate protection.

We support a Class A/Class B distinction in the 71–76 and 81–86 GHz bands. We suggest the current rules be redesignated as Class A and be made applicable to antennas at least two stories or 6 meters off the ground. Class B licenses should have relaxed antenna gain requirements and power levels suitable for elevations of just a few meters.

We oppose mobile use of the 71–76 and 81–86 GHz bands that threatens interference to fixed links. If the Commission approves mobile use—after SAS has been shown to achieve a very high level of reliability—then Class A fixed links (or all links under the present rules) should receive fully protected incumbent status.

We do not oppose indoor unlicensed use at 71–76 and 81–86 GHz if the power levels are low enough to protect outdoor operations, certainly no higher than the current limits at 92–95 GHz.

We oppose all one-size-fits-all renewal requirements. Instead we favor flexible criteria that account for a wide range of use cases, including service to transient users. We do not oppose use-or-share provisions so long as the displaced licensee can participate on the same terms as anyone else.

Below, we address the Commission's proposals band by band, in numerical order, followed by our comments on renewal requirements.

B. 24 GHz Band (24.25–24.45 and 24.75–25.25 GHz)

The Commission proposes to add mobile allocations to 24.25–24.45 and 24.75–25.25 GHz, to grant mobile rights to existing fixed licensees, to add a fixed allocation to 24.75–25.05 GHz, and to authorize both segments under UMFUS. For maximum flexibility, the existing band plans would become two unpaired blocks of 250 MHz or, alternatively, five 100 MHz channels or two 200 MHz channels plus one 100 MHz channel. The proposal would retain the existing satellite limits and coordination procedures at 25.05–25.25 GHz, and would apply these as well to the 24.75–25.05 GHz segment.[3]

The FWCC supports these proposals. In the upper segment we prefer a band plan having two 200 MHz channels and one 100 MHz channel, as being flexible for fixed use, but can work with any of the others.

Our support is conditioned on present fixed licensees receiving mobile authorizations, and on satellite rights not becoming more expansive than at present.

C. 32 GHz Band (31.8–33.4 GHz)

The Commission proposes to add fixed and mobile allocations, and to authorize operation under UMFUS using either 200 MHz or 400 MHz channels.[4] A possible obstacle is the need to protect aeronautical and shipborne radar and space research at Goldstone, CA, particularly from

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3 *Further Notice* at ¶¶ 383–85, 399.

4 *Further Notice* at ¶ 389.

mobile users.[5] Operations would also have to protect radio astronomy and EESS in the adjacent 31.3–31.8 GHz band.[6]

The FWCC tentatively supports the proposal, pending further detail on how as-yet-unspecified measures to protect aeronautical and shipborne radar and space research will affect fixed and mobile operations. We prefer channel widths in multiples of 50 MHz, preferably in 100 MHz increments. We favor protecting the scientific operations at 31.3–31.8 GHz.

D. 42 GHz Band (42–42.5 GHz)

The Commission proposes to authorize fixed and mobile operation under UMFUS as a single channel, or divided into two channels, or divided into multiple 100 MHz channels. The Commission also proposes to add Federal fixed and mobile allocations.[7]

The 500 MHz bandwidth is too narrow for duplex fixed use at these frequencies.[8] If the Commission decides a guard band is needed to protect adjacent radio astronomy operations,[9] the band will become narrower still. A combined fixed/mobile authorization in practice will amount to mobile only. We still think the best solution is the one we proposed back in 2013: to combine 42–42.5 and 42.5–43.5 into a single fixed band. See also Part E, below.

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5 *Further Notice* at ¶¶ 391–93.

6 *Further Notice* at ¶¶ 394–398.

7 *Further Notice* at ¶¶ 403–07.

8 Although the bands at 4 and 6 GHz successfully use 500 MHz bandwidths, millimeter-wave designs require a separation between transmit and receive frequencies that is too big for 500 MHz. We think it unlikely that manufacturers could justify the large investment necessary to accommodate 500 MHz for only this one relatively narrow band.

9 *Further Notice* at ¶ 405.

We reserve judgment on the addition of Federal allocations pending further information on protective measures between Federal and non-Federal users. We favor protecting radio astronomy operations in the adjacent 42.5–43.5 GHz band.

In the event the Commission decides a guard band is needed to protect radio astronomy, we suggest the guard band be limited to fixed-only operation subject to full fixed service frequency coordination (to control emissions in the directions of radio astronomy observation sites) and be regulated as part of the 42.5–43.5 GHz band.

E. 43 GHz BAND (42.5–43.5 GHz)

In 2013 the FWCC filed a Supplemental Petition for Rulemaking that sought authority and rules for fixed service operation in the 42.5–43.5 GHz band.[10] With respect to that petition, the *Further Notice* states:

> [W]e do not deny FWCC's petition with respect to the 42.5–43.5 GHz band because point-to-point operation may be more likely to co-exist with co-channel RAS. We will give further consideration to the 42.5–43.5 GHz band separately.[11]

We ask the Commission to promptly issue an NPRM for fixed service rules at 42.5–43.5 GHz.

We concur with the need to protect radio astronomy operations in this band. Observations at 42.519, 42.821, 43.122, and 43.424 GHz (silicon monoxide) yield important information on stellar temperature, density, wind velocities, and other parameters. These measurements help scientists understand how solar systems develop, which in turn gives insight into the Earth's origins. We recommend that the Commission impose the frequency coordination procedures of

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[10] Supplemental Petition for Rulemaking of the Fixed Wireless Communications Coalition, Inc. (no docket number) (filed Feb. 11, 2013). We had also requested fixed service operation in the 42–42.5 GHz segment, which the Commission denied. *Further Notice* at ¶ 404.

[11] *Further Notice* at ¶ 404.

Section 101.103(d), which will make it possible to fully protect radio astronomy facilities at any reasonable interference criterion.

F. 47 GHz Band (47.2–50.2 GHz)

The Commission proposes to authorize fixed and mobile use under UMFUS with channels that are multiples of either 200 MHz or 500 MHz.[12]

These frequencies are also allocated to FSS for both uplinks and ubiquitous user downlink equipment. The Commission proposes to identity one location in each license area where FSS uplink stations can have co-primary status with UMFUS.[13] Sharing is more difficult between UMFUS and FSS user terminals, however. The Commission suggests three options:

- UMFUS operators provide coordinates and other pertinent information to an SAS, which satellite operators consult to determine where their devices can transmit without causing interference to UMFUS;
- the Commission divides the band into regions where UMFUS and FSS respectively have priority;
- FSS and UMFUS licensees register their operations in a database, which then assigns interference protection on a first-come, first-served basis.[14]

We have doubts about the first option. Even the much simpler technology on which SAS is based—the TV white space database—is not yet fully operational, as no mobile white space devices have been certified. Until SAS technology has shown itself capable of managing many thousands of mobiles simultaneously and prioritizing their access to spectrum at a high level of reliability, we think it unwise to adopt rules on the premise that a still-nascent technology will emerge as expected.

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12 *Further Notice* at ¶¶ 410, 417.

13 *Further Notice* at ¶ 412.

14 *Further Notice* at ¶¶ 413-15.

The third option amounts to an automated form of bilateral frequency coordination. It might be feasible, but the *Further Notice* does not provide enough information for evaluation. For example, the highly successful Part 25/Part 101 frequency coordination regime puts strict time limits on licensing after coordination, construction after licensing, and (as to the fixed service) loading after construction. Will the UMFUS/FSS database plan include similar measures to prevent the hoarding of spectrum? How will it provide for de-registration of facilities that cease operation? We cannot support the option until more information becomes available.

Given the prematurity of the SAS proposal, and the uncertainties around the interference database proposal, the FWCC supports the remaining option, namely, giving UMFUS and FSS priority in different segments of the band.

We also favor measures to protect EESS and space research in the adjacent band at 50.2–50.4 GHz.

G. 50 GHz Band (50.4–52.6 GHz)

The Commission proposes to authorize fixed and mobile use under UMFUS with channels that are 200, 400, or 500 MHz wide,[15] and asks about sharing between UMFUS and FSS at 50.4–51.4 GHz.[16]

The FWCC supports the UMFUS proposal. In principle we do not object to sharing the band with FSS but, as always, much depends on the details. We trust the rulemaking will return to this issue with a more specific proposal.

Again, we favor measures to protect EESS and space research at 50.2–50.4 GHz.

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15 *Further Notice* at ¶¶ 420, 423.

16 *Further Notice* at 421. After release of the *Further Notice*, the Commission put on public notice a Petition for Rulemaking filed shortly before the release, requesting the allocation and authorization of uplink FSS spectrum in the 50.4–51.4 and 51.4–52.4 GHz bands. Petition for Rulemaking of The Boeing Company, RM-11773 (filed June 22, 2016).

H. 57–71 GHz Band—Unlicensed Operation

The Commission seeks information that might support unlicensed operation in the millimeter-wave bands aboard aircraft.[17] The present policy against such operation protects scientific users, particularly EESS, from interference into its satellites.

As a possible first step, the Commission proposes allowing WiGig for inflight entertainment from seatback displays to user devices at power levels adequate to cover a distance of 30–60 cm, and to prohibit use of the first WiGig channel (57.24–59.4 GHz).[18]

The FWCC favors carefully controlling any millimeter-wave operation on board aircraft so as to fully protect EESS. We defer to our colleagues in the EESS community on whether the proposed measures will provide adequate safeguards. If not, then we urge limiting aircraft operations to non-EESS frequencies.

I. 70/80 GHz Bands (71–76 and 81–86 GHz)

1. Density of usage

The Commission supports its proposal for mobile use in these bands in part by noting that the majority of the existing 22,600 fixed links are concentrated in relatively few locations,[19] thus making the rest of the country (in the Commission's words) "the functional equivalent of a green field."[20]

The Commission's information is accurate but misleading. A map of 70/80 GHz usage looks a lot like a map of U.S. population density.[21] In other words, 70/80 GHz links are where

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17 *Further Notice* at ¶ 515.

18 *Further Notice* at ¶ 516.

19 *Further Notice* at ¶¶ 425, 432.

20 *Further Notice* at ¶ 432.

21 A map of 70/80 GHz usage appears in the *Further Notice* at ¶ 432, Figure 3.

the people are. The greatest demand for mobile service will come in those same areas. The existence of lightly-used 70/80 GHz spectrum in other, lightly-populated areas does not predict a lot of available spectrum for mobile service where needed.

2. Class A/Class B Operation

The Commission proposes a distinction between two kinds of point-to-point licenses, to be designated "Class A" and "Class B." Class A users would operate at some minimum height above ground level using high-gain antennas at higher power levels. Class B licenses would authorize use at lower heights—"streetlamp level"—with relaxed gain requirements that will allow wider beamwidths at (presumably) lower power.[22]

The FWCC supports this proposal. We explained in an earlier filing how the continuing surge in popularity of data-intensive mobile devices, particularly smartphones and tablets, has produced a need for small-cell backhaul at elevations close to street level.[23] The Commission's proposed Class B licenses should go a long way toward filling this need. The FWCC has requested relaxed antenna standards for these bands,[24] but those are probably still too stringent for the proposed Class B operation.[25]

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22 *Further Notice* at ¶ 440 (7th bullet).

23 Comment of the Fixed Wireless Communications Coalition in Response to the Commission's Notice of Inquiry in WT Docket No. 10-153 (filed Oct. 5, 2012).

24 Comment of the Fixed Wireless Communications Coalition in Response to the Commission's Notice of Inquiry in WT Docket No. 10-153 (filed Oct. 5, 2012), *amended*, Letter from Mitchell Lazarus, Counsel, FWCC, to Marlene H. Dortch, Secretary, FCC in WT Docket No. 10-153 (filed April 4, 2013), *further amended*, Letter from Mitchell Lazarus, Counsel, FWCC, to Marlene H. Dortch, Secretary, FCC in WT Docket No. 10-153 (filed March 24, 2014). FWCC member Aviat Networks, through its affiliate Aviat U.S., Inc., filed and twice amended a request for waiver pending the rulemaking that parallels the FWCC's filings.

25 The fixed service rules specify two categories of antenna standards for all bands (except 70/80/90 GHz) denoted Category A and Category B. 47 C.F.R. § 101.115. The FWCC's relaxed standards are suitable for Category B antennas authorized for Class A operation.

Class A licenses will continue to serve functions typical of the bands' present usage, as for cellular backhaul and connecting campus buildings. We suggest that the current 70/80 GHz rules be redesignated Class A and be made applicable to antennas mounted on or above a building at least two stories in height, or on a tower at least 6 meters off the ground.

3. Mobile operation

The Commission proposes introducing mobile services to the 70/80 GHz bands. An SAS would administer three priority levels similar to those adopted for the 3550–3700 MHz Citizens Radio Broadband Service: (1) incumbent access, (2) auctioned priority access, and (3) unauctioned general access.

The FWCC has grave concerns about the idea. The 70/80 GHz bands have been a major success for point-to-point use, and are needed to address the growing need for backhaul, discussed above. The Commission should not jeopardize ongoing investment in the band by introducing unnecessary uncertainty.

SAS technology is still unproven, as we noted above in Part F. Even its predecessor technology, the TV white space database, has never been tested in commercial use with mobile devices. Regulatory action now predicated on the SAS protecting fixed links is premature.

If the Commission resolves to proceed with flexible use in the 70/80 GHz bands, we ask that it wait until real-world testing has proven the SAS to be effective at preventing interference. We further ask that Class A links (and links authorized under the present rules) qualify for incumbent access status for as long as they remain operational, no matter when registered.

Incumbent status will acknowledge the reasonable expectations of companies that made a success of the bands by investing in them. Class A operation (and present operation), using narrow beams high off the ground, will have little or no impact on mobile operation, and hence,

little effect on the value of flexible-use licenses. Conversely, though, without protected incumbent status, the prospect of mobile use makes the construction of additional fixed links a risky undertaking.

4. Indoor-only unlicensed operation

The Commission proposes indoor-only unlicensed use of these bands under Part 15.[26]

The FWCC does not oppose the proposal if the power limits are suitably low—certainly no higher than the unlicensed limit at 92-95 GHz (9 uW/sq. cm at 3 meters for average power, equivalent to 40.1 dBm.)[27] This is on the high side for unlicensed use, well above the limit in the popular 2.4 and 5.8 GHz bands, which permit outdoor use and have no licensed in-band commercial operations.[28] Significantly higher levels at 70/80 GHz would pose a risk of interference to outdoor operation, especially in commercial areas where exterior building walls are made largely of glass and an indoor user's window may be level with a neighboring rooftop supporting an outdoor antenna.[29] Lower limits should be fully practical for indoor use.

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[26] *Further Notice* at ¶ 440 (8th bullet).

[27] 47 C.F.R. § 15.257(c)(1). The peak limit is 3 dB higher.

[28] 47C.F.R. §§ 15.247(b), 15.407(a)(3). On the other hand, there are differences in how power is measured at 2.4 and 5.8 GHz versus 92-95 GHz. The bands also have different propagation characteristics and different allowances for antenna gain.

[29] This is not a hypothetical configuration. Our own office windows overlook an adjacent rooftop holding a small fixed antenna.

5. Different rules for areas with denser use

The Commission asks whether a separate regulatory framework is appropriate for the sixteen counties that are heavily registered with incumbent users.[30]

The FWCC favors uniform nationwide rules, assuming the Commission (1) grants incumbent status to Class A users (or users under the present rules), and (2) delays mobile operation until SAS technology is fully and successfully field-tested. In the absence of either condition, we disfavor mobile use in counties having a site density averaging more than one transmit or receive site per square mile.[31] But this option is a distant second choice. As fixed usage continues to grow, other counties will exceed the threshold. By then some of those counties may have mobile users, making a limitation to fixed-only use impractical. A far better solution is to first perfect the SAS and protect Class A fixed users.

J. RENEWAL REQUIREMENTS

The Commission has adopted the following renewal requirements:

- *Mobile and point-to-multipoint at 28 GHz, 37 GHz geographic area licenses, and 39 GHz*: cover at least 40 percent of the license area population, and be using the facilities to provide service;
- *Fixed Service at 28, 37, and 39 GHz*: construct and operate at least four links in license areas with less than 268,000 population, and at least one link per 67,000 population in license areas with greater population; and
- *Combination of services*: meet the relevant fixed or mobile/point-to-multipoint standards separately, to be evaluated on a case-by-case basis.[32]

The Commission proposes these additional categories of performance assessment:

- unspecified metrics for the Internet of Things;

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30 *Further Notice* at ¶ 440 (9th bullet).

31 *See Further Notice* at ¶ 440 n.1165.

32 *Further Notice* at ¶¶ 210.

- metrics based on numbers of devices connected, data transmitted, and /or numbers of sessions;
- metrics for transient populations such as corporate campuses, interstate highways, and event venues; and
- metrics for combinations of fixed and mobile services.[33]

The FWCC opposes rigid, one-size-fits-all renewal criteria. We particularly oppose percentage-of-population and links-per-million requirements. The latter worked badly in the past, in part because the criteria ignored licensees' substantial investments that had not yet materialized into working links.[34] Percentage-of-population requirements are subject to the same defects. When the rules are vague, as they are at present,[35] safe harbors become *de facto* requirements.

We support flexible metrics that address a wide variety of spectrum use cases, including transient user populations. The rules should list alternative criteria, possibly including percentage-of-population and links-per-million along with others mentioned above: connected devices, data volume, etc. To accommodate licensees that serve transient populations, the list should have short-term, high-volume options, such as the peak number of devices connected in any hour-long period. A licensee should qualify for renewal if it meets any of the criteria.

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33 *Further Notice* at ¶¶ 466-70.

34 As we explained elsewhere, these requirements may have perversely deterred construction by penalizing any investment that was less than certain to produce the requisite number of working links in less than the required time. Comments of the Fixed Wireless Communications Coalition in GN Docket No. 14–177 *et al*. at 5-7 (filed Jan. 27, 2016).

35 "'Substantial service' [for renewal] is a service which is sound, favorable, and substantially above a level of mediocre service which just might minimally warrant renewal." 47 C.F.R. § 101.527(a) (for 24 GHz).

Use or share. The Commission seeks comment on use-or-share mechanisms, under which areas that the licensee has not built out to specified criteria would become available for use by others.[36]

We do not oppose use-or-share mechanisms, assuming a ten-year license term and suitably flexible renewal requirements, plus an understanding that the licensee (by then a former licensee) can participate in sharing arrangements on the same terms as any other party.

CONCLUSION

We urge the Commission to adopt rules as outlined above.

Respectfully submitted,

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[36] *Further Notice* at ¶¶ 474-82.