Before the
**Federal Communications Commission**
Washington DC 20554

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| In the Matter of | ) | |
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| Fixed Service Non-Federal Allocation and | ) | File No. RM- _____ |
| Service Rules in the 42.5-43.5 GHz Band | ) | |

# SUPPLEMENTAL PETITION FOR RULEMAKING

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## SUPPLEMENTAL PETITION FOR RULEMAKING

Pursuant to Section 1.401 of the Commission's Rules, the Fixed Wireless Communications Coalition, Inc. (FWCC)[1] files this Supplemental Petition to request a non-Federal Fixed Service (FS) allocation and the establishment of service rules for FS operations at 42.5-43.5 GHz ("43 GHz band"). A grant of the present request, along with the FWCC's pending request for service rules at 42-42.5 GHz ("42 GHz band"), as modified today, will result in uniform rules over the entire 1.5 GHz range of 42-43.5 GHz ("42/43 GHz band").

### A. SUMMARY

In May 2012, the FWCC filed a Petition for Rulemaking that requested FS service rules at 41-42.5 GHz.[2] In response to a showing by the Satellite Industry Association, the FWCC withdrew its request as to the 41-42 GHz part of that band, but let the petition stand as to 42-42.5

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[1] The FWCC is a coalition of companies, associations, and individuals interested in the fixed service—i.e., in 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, 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] Petition for Rulemaking of the Fixed Wireless Communications Coalition, RM-11664 (filed May 9, 2012) ("FWCC 42 GHz Petition").

GHz. A grant of that amended petition, together with this one, will provide 1.5 GHz of contiguous FS spectrum from 42 through 43.5 GHz. The FWCC today is filing an *ex parte* letter in the 42 GHz docket to further amend our 42 GHz Petition, seeking the same channelization rules and power limits for 42 GHz band that we propose below for 43 GHz. If the Commission grants our requests as to both bands, the resulting rules will provide for uniform channelization and power limits over 42-43.5 GHz, which can then be regulated and operated as a single FS band.

This spectrum can help to meet the growing demand for "backhaul," *i.e.*, the carriage of data between a cell tower and the carrier's network facilities. The need for spectrum to link mobile data devices (such as smartphones and tablet computers) with cell towers, is well known and widely discussed. Yet every byte of data moving to or from the mobile device must also be backhauled between the tower and the network. Point-to-point microwave is one of just two technologies capable of providing high-capacity backhaul, the other being fiber-optic cable. In some environments, particularly in rough terrain and built-up population centers, fiber is expensive or impossible to install, so that carriers must look to microwave.

The carriers' practice of reusing scarce mobile spectrum by making their cells smaller and more numerous increases the need for backhaul spectrum to carry large amounts of data over short distances. In urban settings, backhaul antennas often must be small enough for installation on crowded building tops and towers. The 42/43 GHz band, with its short wavelength and correspondingly small antennas, is ideal for this application. The growing use of small-cell technologies for data delivery will add further demand for limited-range backhaul.

Presently the 43 GHz band is allocated for Federal fixed, mobile, and fixed satellite uplinks, and for Federal and non-Federal Radio Astronomy Service (RAS). The FWCC

understands the band is used by a relatively small number of Federal uplink earth stations, and for RAS observations at thirteen facilities. Below, the FWCC requests an allocation for non-Federal fixed operations, with rules to protect the RAS sites and requiring FS users to accept interference from Federal earth stations.

The FWCC opposes area licensing for the 42/43 GHz band because this approach has led to underutilization of other FS bands at 24 GHz and above. Instead we favor link-by-link licensing with prior frequency coordination, as is required for the FS bands at 23 GHz and below. This regime has consistently yielded dense deployment, where there is demand, and impressive spectrum efficiency, while maximizing the protection to co-primary services.

In short, the rules requested here will allow the Commission to meet the rapidly growing need for backhaul spectrum with no significantly adverse impact on other users.

### B. PROCEDURAL BACKGROUND

On May 9, 2012, the FWCC filed a Petition for Rulemaking seeking FS rules at 41-42.5 GHz, just below the 43 GHz band referenced in the present request.[3] The FWCC there noted that the entire 41-42.5 GHz band had an FS allocation, co-primary with the Fixed Satellite Service (FSS) at 41-42 GHz. The FWCC noted further that the Commission in 2004 tentatively proposed to auction area licenses at 42-42.5 GHz, as it had done in the nearby 39 GHz band.[4] The FWCC's May 2012 petition asked the Commission to rethink that proposal, which is still pending. We showed that area licensing in general, and the renewal standards in particular, had

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[3] See Table 1. The Commission put the 41-42.5 GHz Petition on public notice in docket RM-11664. *Consumer & Governmental Affairs Bureau Reference Information Center Petitions for Rulemaking Filed*, Report No. 2953 (released June 7, 2012).

[4] FWCC 42 GHz Petition at 5; *Amendment of the Commission's Rules Regarding the 37.0-38.6 GHz and 38.6-40.0 GHz Bands*, Third Notice of Proposed Rulemaking, 19 FCC Rcd 8232 at ¶¶ 31-55 (2004) (*37-40 GHz Third NPRM*).

deterred construction in the 39 GHz band and other auctioned FS bands.[5] We explained the need for spectrum to accommodate short-haul point-to-point applications, particularly for wireless data backhaul—*i.e.*, to connect the burgeoning population of cell towers to carriers' network facilities—and argued that frequency coordinated link-by-link licensing, similar to that used at 4, 6, 10, 11, 18, and 23 GHz, is the best way to meet that need.[6]

<table>
<tr><th>Band</th><th>Initial Requests</th><th>Subsequent Changes</th><th>Current Status</th></tr>
<tr><td>41-42 GHz</td><td rowspan="2">FS rules requested in RM-11664</td><td>request for FS rules withdrawn</td><td>no FS request pending</td></tr>
<tr><td>42-42.5 GHz<br>("42 GHz band")</td><td>request for FS rules modified to conform to present petition</td><td rowspan="2">request for uniform FS rules over 42-43.5 GHz ("42/43 GHz band")</td></tr>
<tr><td>42.5-43.5 GHz<br>("43 GHz band")</td><td colspan="2">FS rules requested in present petition</td></tr>
</table>

**Table 1**
**Status of Bands at 41-43.5 GHz**

The Satellite Industry Association opposed.[7] Among other objections, it noted a pending satellite application that proposes to use the 41-42 GHz band for downlinks to "widely deployed user terminals."[8] The FS has experienced great difficulty in the past in attempting to share FSS spectrum used for ubiquitous downlinks. Moreover, the FWCC acknowledges that the Commission's "soft segmentation" plan gives preference to the FSS at 41-42 GHz,

5 FWCC 42 GHz Petition at 5-8.

6 FWCC 42 GHz Petition at 8-9.

7 Opposition of the Satellite Industry Association in RM-11664 (filed July 9, 2012).

8 Opposition of the Satellite Industry Association, at 3 n.9 (citing Application of Hughes Network Systems, LLC in SAT-LOA-20111223-00248 at 8 (filed Dec. 23, 2011))

notwithstanding the co-primary allocation to FS.[9] For these reasons the FWCC withdrew its request for FS service rules as to 41-42 GHz.[10]

At the same time, however, the FWCC maintained its request for FS rules at 42-42.5 GHz, which presently has an FS allocation, but not one for FSS. The FWCC supported the deletion of an unused Broadcasting-Satellite allocation, and opposed the addition of a new FSS allocation.[11]

The present request for a non-Federal FS allocation and service rules at 43 GHz, together with our pending request for FS rules at 42 GHz, would provide 1.5 GHz of FS spectrum at 42-43.5 GHz. (See Table 1.) Simultaneously with this filing, the FWCC is adjusting certain technical parameters of its request at 42-42.5 GHz with the goal of placing the entire 42-43.5 GHz segment under uniform service and technical rules.

### C. NEED FOR SPECTRUM

The spectrum at 43 GHz is ideally suited to the dense deployment of short FS links, each typically bridging a few kilometers or less. The emerging need for shorter links, and more of them, continues a decades-long trend in FS deployment. The earliest fixed microwave systems, beginning in the 1950s, used enormous towers up to 70 km apart to traverse the United States and Canada with telephone calls, Teletype messages, and television programming. To be sure,

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9 *See 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*, Second Report and Order, 18 FCC Rcd 25428 at ¶ 14 (2003) (*V-Band Designation Order*).

10 Reply of the Fixed Wireless Communications Coalition in RM-11664 (filed July 24, 2012).

11 *Id*. *See also* Letter from Mitchell Lazarus, Counsel for FWCC to Marlene H. Dortch, Secretary, FCC in IB Docket No. 97-95 (filed July 24, 2012). The 42-42.5 GHz FSS allocation that we oppose was floated in *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*, Third Notice of Proposed Rulemaking, 25 FCC Rcd 15663 at ¶ 17 (2010) (*V-Band Third NPRM*).

there remains a continuing need for long-haul systems (and a shortage of low-frequency spectrum to support them). But over the years, as engineers have developed technologies capable of communicating at ever-higher frequencies, the Commission has opened ever-higher frequency bands. There is an inverse relationship, however, between frequency and range: other things being equal, higher frequencies are able to cover only shorter distances.

Today, the fastest-growing need is for large numbers of short-distance links, of the kind that 43 GHz can support. Because the short, seven-millimeter wavelength at 43 GHz does not readily penetrate either natural terrain or man-made structures, reliable transmission requires direct line-of-sight between the transmit and receive antennas. But the short wavelength also has advantages: it produces tight, well-focused beams from relatively small antennas, which facilitates re-use of the same frequencies close by. Smaller antennas can be esthetically less obtrusive. And the availability of greater radio bandwidth at higher frequencies allows for high rates of data transmission.

Rapid growth in the nation's data consumption has been widely documented.[12] One consequence is an increasing need for high-capacity links among neighboring buildings. Just a decade or two ago, the structures that make up a hospital, college, or university, the campus of a large corporation, a state or municipal government complex, or an industrial park could be adequately tied together with copper wire. No longer. The data demands of a modern enterprise can be satisfied only with interconnections using optical fiber or microwave radio. But in some

[12] *See generally National Broadband Plan: Connecting America* at Ch. 3 "Current State of the Ecosystem" (released March 16, 2010), *available at* http://www.broadband.gov/plan/.

environments, the installation of fiber is prohibitively expensive, and sometimes physically impossible, leaving microwave as the only feasible option.[13]

Another trend in data usage relates to the ongoing shift away from desktop devices, wired into the wall, and toward mobile, radio-dependent data devices such as smartphones and tablet computers. All such devices (except Wi-Fi-only tablets) are served by cell towers. And all of the data traffic that moves between the devices and the cell towers must also transit between the cell towers and the carrier's network facilities—a connection known generically as backhaul. The vast majority of high-capacity backhaul is carried by fiber-optic cable or microwave. Again, particularly in rugged terrain and built-up urban areas, the expense of installing fiber-optic cable may leave microwave as the most feasible option.

The shortage of spectrum for mobile data end-user connections has been widely discussed.[14] Only a limited range of frequencies is suitable for mobile applications, nearly all of it presently occupied. A recent auction of 700 MHz spectrum, a frequency range ideal for end-user mobile data, cost the winning carriers almost $20 billion for 52 MHz. Carriers squeezed for spectrum and unable to acquire more respond by deploying ever-smaller cells, especially in heavily populated areas, so as to free up the same frequencies for reuse close by. The shrinkage and multiplication of cells sets off a commensurate growth in demand for short-range backhaul

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[13] Another alternative for some campus applications is free-space optics (FSO), consisting of a laser beam of light directed between buildings. FSO offers very high data rates under ideal conditions, but is subject to attenuation from atmospheric pollution and smog, rain, fog, and snow, and to interference from the Sun and man-made bright lights.

[14] Committee on Science, Space, and Technology, Press Release, *Subcommittee Reviews Innovative Solutions to Alleviate 'Looming Spectrum Crisis', available at* http://science.house.gov/press-release/subcommittee-reviews-innovative-solutions-alleviate-%E2%80%98looming-spectrum-crisis%E2%80%99 (April 18, 2012); M. Lazarus, *The Great Radio Spectrum Famine*, IEEE SPECTRUM, Oct. 2010, *available at* http://spectrum.ieee.org/telecom/wireless/the-great-radio-spectrum-famine/0.

links with high data capacity. Additional short-range backhaul demand will come from the Commission's plans to authorize small-cell systems in the 3550-3650 MHz band.[15] All such applications are excellent candidates for 43 GHz transmission.

### D. ALLOCATIONS

The FWCC requests a co-primary non-Federal Fixed allocation in the 42.5-43.5 GHz band.

Current allocations for the band are as follows:

| Frequency (GHz) | ITU Regions 1, 2, 3 | U.S. Federal | U.S. Non-Federal |
|---|---|---|---|
| 42.5-43.5 | FIXED<br>FIXED-SATELLITE (Earth-to-space) 5.552<br>MOBILE except aeronautical mobile<br>RADIO ASTRONOMY<br><br>5.149, 5.547 | FIXED<br>FIXED-SATELLITE (Earth-to-space)<br>MOBILE except aeronautical mobile<br>RADIO ASTRONOMY<br><br>US342 | RADIO ASTRONOMY<br><br><br><br><br>US342 |

**Table 2**
**Allocations at 42.5-43.5 GHz**

Below are the footnotes cited in the allocation table, together with the FWCC's comments:

> **5.149** In making assignments to stations of other services to which the bands: . . . 42.5-43.5 GHz . . . are allocated, administrations are urged to take all practicable steps to protect the radio astronomy service from harmful interference. . . .
>
> ***FWCC comment***: The FWCC proposes rules for the 42.5-43.5 GHz band that protect RAS installations against harmful interference. *See* Part F(1) below.
>
> **5.547** The bands . . . 40.5-43.5 GHz . . . are available for high-density applications in the fixed service (see Resolution 75 (WRC 2000)). Administrations should take this into account when considering regulatory provisions in relation to these bands. . . . .
>
> ***FWCC comment***: The FWCC proposes that FS operations at 42-43.5 GHz be subject to link-by-link frequency coordination, pursuant to Section 101.103(d), in part to afford protection to RAS and to Federal installations in the band.
>
> **5.552** The allocation of the spectrum for the fixed-satellite service in the bands 42.5-43.5 GHz and 47.2-50.2 GHz for Earth-to-space transmission is greater than that in the band 37.5-39.5 GHz for space-to-Earth transmission in order to accommodate feeder links to broadcasting

[15] *Commercial Operations in the 3550-3650 MHz Band*, Notice of Proposed Rulemaking and Order, 25 FCC Rcd 18661 (2012).

satellites. Administrations are urged to take all practicable steps to reserve the band 47.2-49.2 GHz for feeder links for the broadcasting-satellite service operating in the band 40.5-42.5 GHz.

***FWCC comment***: The Commission has proposed deletion of the Broadcasting-Satellite allocation from 42-42.5 GHz.[16] The proposal has no opposition,[17] and is supported by the FWCC.[18]

**US342** In making assignments to stations of other services to which the bands: . . . 42.5-43.5 GHz, 42.77-42.87 GHz*,43.07-43.17 GHz*, 43.37-43.47 GHz* . . . are allocated (*indicates radio astronomy use for spectral line observations), all practicable steps shall be taken to protect the radio astronomy service from harmful interference. Emissions from spaceborne or airborne stations can be particularly serious sources of interference to the radio astronomy service (*see* ITU *Radio Regulations* at Nos. 4.5 and 4.6 and Article 29).

***FWCC comment***: See comment above to footnote 5.149.

Nothing in the present allocations and footnotes prevents the requested reallocation, in view of the compatibility between FS and satellite uplinks and the commitment of the FS to protect RAS and Federal users.

Prior to 1998, Federal and commercial users had shared allocations at both 42.5-43.5 GHz and 47.2-48.2 GHz. A 1998 order split those two allocations, identifying 42.5-43.5 GHz for exclusive Federal use and 47.2-48.2 GHz for exclusive commercial use.[19] The Commission intended the commercial allocation at 47.2-48.2 GHz to meet the then-projected needs of High Altitude Platform Service (HAPS) operators.[20] But HAPS did not develop as anticipated.[21] The Commission subsequently proposed to return both the both 42.5-43.5 and 47.2-48.2 GHz bands

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16 *V-Band Third NPRM* at ¶¶ 12-16.

17 *See generally* IB Docket No. 97-95.

18 Letter from Mitchell Lazarus, Counsel for FWCC to Marlene H. Dortch, Secretary, FCC, in IB Docket No. 97-95 (filed July 24, 2012).

19 *Allocation and Designation of Spectrum*, Report and Order, 13 FCC Rcd 24649 at ¶ 41 (1998).

20 *V-Band Designation Order* at ¶ 60.

21 *Id*. at ¶ 61.

to their earlier shared allocations,[22] but dropped the idea at the request of NTIA.[23] As an alternative, the Commission also suggested swapping allocations between 47.2-48.2 GHz, which would become exclusively Federal, and 42.5-43.5 GHz band, which would become exclusively commercial.[24] The Commission subsequently abandoned that proposal as well.[25]

The Commission last considered a non-Federal reallocation of the 42.5-43.5 GHz band in 2003.[26] At the time of the 2003 *V-Band Designation Order*, NTIA disfavored commercial operations at 42.5-43.5 GHz. Not only were there then Government systems operating in the band, which is immediately adjacent to the Government satellite band at 43.5-45.5 GHz,[27] but NTIA saw 42.5-43.5 GHz as potentially accommodating an expansion of Government Earth-to-space operations.[28] In fact, NTIA had begun encouraging Federal agencies to use 42.5-43.5 GHz as a substitute for 37-38.6 GHz, [29] which was (and remains) jointly allocated to Federal and non-Federal users.[30]

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22 *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*, Further Notice of Proposed Rulemaking, 16 FCC Rcd 12244 at ¶¶ 28-31 (2001) (*V-Band Further Notice*).

23 *V-Band Designation Order* at ¶ 64.

24 *V-Band Further Notice* at ¶ 30.

25 *V-Band Designation Order* at ¶ 61 n.181.

26 *Id.* at ¶¶ 59-67.

27 *Id.* at ¶ 62.

28 *Id*.

29 *Id*.

30 The Commission proposed, but never adopted, principles for sharing between Federal and commercial users at 37-38.6 GHz. *37-40 GHz Third NPRM* at ¶¶ 83-95 (2004).

The limited information available to us, however, suggests that Federal use of the 42.5-43.5 GHz band may not have grown as expected. Moreover, because the Federal satellite allocation in the band is limited to uplinks, Federal users will not experience interference from FS links. As explained in more detail below, we propose link-by-link licensing with full frequency coordination, which will enable FS users to avoid incoming harmful interference from Federal earth stations. We will welcome the opportunity to discuss these plans detail with NTIA.

There is presently no non-Federal FSS allocation at 42.5-43.5 GHz. The FWCC opposes creating one. Even in bands where FS and FSS are supposedly co-primary, FS/FSS sharing disproportionately hampers FS service relative to FSS.[31] Furthermore, an unpaired band at 42.5-43.5 GHz would be of minimal value to FSS, while being of great potential importance to the FS industry.

### E. CHOICE OF BAND

Given the non-Federal allocation at 47.2-48.2 GHz, it might be reasonable to ask why the FWCC does not request service rules for that band, rather than a reallocation of 42.5-43.5 GHz.[32]

The Commission accurately anticipated one reason for our preference for 42.5-43.5 GHz:

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[31] The imbalance arises because the Commission routinely licenses an FSS earth station for the entire allocated band, without regard to any actual need for bandwidth, while point-to-point FS terrestrial licensees are limited to frequencies needed. Moreover, earth stations are routinely licensed for all azimuths and elevations that point to the geosynchronous arc, and can deny coordination to FS operators on that basis, while each FS link is licensed only for a particular azimuth. FS users thus must protect large amounts of unused bandwidth over large unused azimuth sectors, while earth station operators need protect only the FS spectrum and directions in actual use. *See Communications Satellite Corp*., Memorandum Opinion, Order and Authorization, 8 FCC 2d 1001, 1003 (1967) (describing consistent practice in the United States to "coordinate[] the entire bands 5925-6425 MHz (transmit) and 3700-4200 MHz (receive) and all azimuths from 0º-360º and all elevation angles from 5º and above, in order to allow for flexibility of operation.") The same is true in other shared bands.

[32] The Commission has approved at least one satellite application proposing to use 47.2-48.2 GHz for FSS gateway uplinks. *Northrop Grumman Space & Mission Systems Corp.*, Order and Authorization, 24 FCC Rcd 2330 at ¶ 38 (2009).

> Other things being equal, most [FS] operators would prefer to operate at the lower frequencies in the 42.5-43.5 GHz band than the higher frequencies in the 47.2-48.2 GHz band due to the lower band's somewhat superior propagation characteristics.[33]

Moreover, and importantly, the adjacency of the 42.5-43.5 GHz band to 42-42.5 GHz will yield 1.5 GHz of contiguous spectrum. Equipment manufacturers have told the FWCC that 1.5 GHz is the minimum bandwidth, at these frequencies, for which it is feasible to design a reasonably economical radio. One reason is the need to keep the transmit and receive frequencies far enough apart that the receiver can suppress transmissions from the same unit. For a system capable of bandwidths up to 100 MHz, as we propose below, the practical minimum separation is about 750 MHz. Allowing for adequate capacity in both directions, that brings the minimum practical overall bandwidth to 1.5 GHz.

Finally, our proposed use of 42-43.5 GHz conforms to international segmentations. This not only gives U.S. providers ready access to equipment already developed for overseas markets, but also promotes exports by U.S. manufacturers.

### F. PROTECTION OF OTHER SERVICES

#### *1. Radio astronomy*

There are primary allocations at 42.5-43.5 GHz for both Federal and non-Federal RAS. The FWCC acknowledges that FS operators must protect RAS from harmful interference at the thirteen sites listed in Table 3. (Sites marked "A" in the Note column require more stringent protection than sites marked "B"; details below.) Considering the small number of RAS sites involved and, in most cases, their locations away from heavily populated areas, we expect RAS priority to have little adverse impact on FS operations. The FWCC is in productive talks with the RAS community about protection along these lines:

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[33] *V-Band Designation Order* at ¶ 61.

- Individual frequency coordination with an RAS site to be required for an FS station proposing to operate in the 42.5-43.5 GHz band inside the following "keyhole" shape: within 200 km of either an "A" or a "B" site along the main beam axis of the FS antenna plus or minus five degrees, and within 125 km of the "A" sites and within 75 km of the "B" sites at other azimuths. Outside those limits, coordination with RAS is not required.[34] (We expect that an FS application predicting interference to an RAS site will often be able to coordinate successfully by reversing the transmit and receive frequencies, if necessary, so that the beam directed toward the RAS site falls in the 42-42.5 GHz segment not allocated to RAS.)

- For FS applications subject to frequency coordination, the "A" sites to be protected at a level of -227 dBW/$m^2$/Hz, and the "B" sites at a level of -175 dBW/$m^2$/Hz, taking into account, among other factors, terrain and the curvature of the Earth.[35]

- FS transmitters intending to intending to orient an antenna within 5 degrees and within 200 km of an RAS site and to use Automatic Transmit Power Control (ATPC) may coordinate at the non-ATPC power (also called "ATPC Low" or "nominal"), inasmuch as conditions that attenuate reception sufficiently to trigger an ATPC power increase (such as rain fade) can be expected to attenuate the signal reaching the RAS site by at least a like amount.

- The costs of preparing and distributing a Prior Coordination Notice for frequency coordination with RAS to be borne by the FS applicant.

- If, notwithstanding compliance with the foregoing, an RAS operator reasonably suspects an FS station of causing harmful interference, the FS licensee will cooperate with the RAS operator in investigating and resolving the interference.

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[34] "The coordination zone defines a region around a radio astronomy observatory outside of which the users of the active service can transmit freely without causing interference detrimental to radio astronomy observations." ITU Recommendation ITU-R RA.1031-2 at § 4 (1994-1995-2007).

[35] These levels derive from ITU Recommendation ITU-R RA.769-2 (1992-1995-2003).

| Site | Note | N. lat. | W. long. | Site | Note | N. lat. | W. long. |
|---|---|---|---|---|---|---|---|
| National Radio Astronomy Observatory (NRAO), Robert C. Byrd Telescope, Green Bank, WV | A | 38° 25' 59" | 79° 50' 23" | VLBA Los Alamos, NM | B | 35° 46' 30" | 106° 14' 44" |
| NRAO, Very Large Array, Socorro, NM | A | 34° 04' 44" | 107° 37' 06" | VLBA Mauna Kea, HI | B | 19° 48' 05" | 155° 27' 20" |
| Pisgah Astronomical Research Institute, NC | A | 35° 11' 59' | 82° 52' 19' | VLBA North Liberty, IA | B | 41° 46' 17" | 91° 34' 27" |
| VLBA Brewster,WA | B | 48° 07' 52" | 119° 41' 00" | VLBA Owens Valley, CA | B | 37° 13' 54" | 118° 16' 37" |
| VLBA Fort Davis,TX | B | 30° 38' 06" | 103° 56' 41" | VLBA Pie Town, NM | B | 34° 18' 04" | 108° 07' 09" |
| VLBA Hancock, NH | B | 42° 56' 01" | 71° 59' 12" | VLBA Saint Croix, VI | B | 17° 45' 24" | 64° 35' 01" |
| VLBA Kitt Peak, AZ | B | 31° 57' 23" | 111° 36' 45" | | | | |

**Table 3**
**RAS Sites Using 42.5-43.5 GHz**

### *2. Federal operations*

There are also primary allocations at 42.5-43.5 GHz for Federal Fixed, Fixed-Satellite (Earth-to-space), and Mobile (except aeronautical mobile).

To the best of our information, the Federal government uses the 43 GHz band only for fixed satellite service uplinks, and at relatively few sites. FS operations present no interference threat to these uplinks. An FS transmitter cannot affect a satellite in orbit unless aimed almost directly at it. The Commission requires a waiver for FS transmitters directed close to the geostationary arc in three shared FS/FSS uplink bands so as to ensure there will be no interference to satellite transponders.[36] We have no objection to a similar provision for the 43 GHz band. In addition, acknowledging Federal priority, the FS will be prepared to accept interference from Federal earth stations.

[36] 47 C.F.R. § 101.145 (referencing 2655–2690 MHz, 5925–7075 MHz, and 12.7–13.25 GHz).

### G. PROPOSED SERVICE AND TECHNICAL RULES FOR 42.5-43.5 GHZ

For the 42.5-43.5 GHz band, we propose the same licensing rules, for the same reasons, as we did for the 41-42.5 GHz band (later amended to 42-42.5 GHz).[37] For the convenience of commenters, we repeat the relevant parts of that request below.

The channelization scheme and power limits proposed here, however, are different from the original request at 42 GHz. As noted above, we are filing today in the 42 GHz docket (RM-11664) to bring the 42 GHz request into conformance with the proposed rules laid out below. The following discussion accordingly applies to the combined 42-43.5 GHz band.

#### *1. Area licensing not suitable for 42/43 GHz*

The Commission has shown a recurring preference for area licensing at frequencies above 23 GHz (except at 70/80/90 GHz). In particular, the Commission's 2004 proposal for 42-42.5 GHz would have substantially conformed the band's service rules to those in force for the 38.6-40.0 GHz (39 GHz) band: *viz*., licenses auctioned by Economic Area (EA) with a "substantial service" build-out requirement.[38] Those rules never took effect. But the Commission has applied generally similar rules to the 24, 28, and 31 GHz FS bands as well. All of these bands remain severely underutilized, notwithstanding Commission efforts to provide additional flexibility through secondary markets and leasing.[39] There is no current need for additional area

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[37] FWCC 42 GHz Petition at 5-9, *amended by* Reply of the Fixed Wireless Communications Coalition in RM-11664 (filed July 24, 2012).

[38] *37-40 GHz Third NPRM* at ¶ 2. That NPRM also suggested an alternative approach: site-based link registration like that used in the 70, 80, and 90 GHz bands. *Id*. at ¶ 9.

[39] *See Promoting Efficient Use of Spectrum Through Elimination of Barriers to the Development of Secondary Markets*, Report and Order and Further Notice of Proposed Rulemaking, 18 FCC Rcd 20604 (2003).

licensing. There is, however, an immediate and growing need for additional spectrum made available through site-by-site licensing.

The area-licensing service rules are largely responsible for those bands' underutilization. FWCC members who hold area licenses report that renewal standards in particular are a significant obstacle to building out. In particular, a reliance on quantitative "safe harbors" for renewal-time showings of substantial service can work against needed technologies and long-term business models. The comments of FiberTower Corporation make the point well:

> By relying almost exclusively on quantitative safe harbors, the Commission has narrowly limited its review to whether a licensee has made investments specifically for the service area and frequencies at issue in the renewal application instead of considering investments made by the licensee to place it in a position to even develop its spectrum on a nationwide or regional basis. Investments in fiber, in real estate rights, in equipment warehousing and a distribution network, in a [network operations center], and in the development of reliable long-term relationships with equipment partners make it possible for FiberTower to provide service in the relevant area even though the investment is not considered for purposes of the safe harbor. In fact, *the investments necessary to groom the spectrum for commercial long-term use often represent more than 90% of the actual costs of providing service*. In other words, more than 90% of the costs must be incurred prior to ever installing a radio.[40]

The area-licensing renewal requirements can have the perverse effect of actually hindering build-out. A company that fails to meet the requirements, and thereby loses its license, will have to walk away from whatever investment it made in the band. Compounding this loss is the subsequent and substantial investment in alternative technology to carry traffic originally provisioned on the abandoned link. A prudent licensee will refrain from making the substantial upfront investment described above if it perceives a risk that it may lose its license before reaching the stage of profitable returns. Potential customers of the area licensee (such as wireless

[40] *Amended Comments of FiberTower*, WT Docket No. 10-112, at 15 (filed Aug. 6, 2010) (emphasis added; footnote omitted).

carriers needing backhaul services) may be reluctant to sign on if they think the underlying license may be in jeopardy, thus adding to the risk of default.

An additional level of renewal uncertainty arises from the Commission's pending proposal for a unified renewal showing for multiple wireless services.[41] Such a potential change in the requirements for wireless point-to-point services only compounds the disincentive to invest in building out. Finally, the nature of exclusive geographic licensing prevents other potential users from easily stepping in when a licensee fails to construct. A 39 GHz license abandoned for the above reasons, for example, may take years to relicense.

The Commission recently told Congress that site-by-site licensing in the 11, 18, and 23 GHz FS bands yields efficient use of the spectrum.[42] The Government Accountability Office told Congress the same, and added that it sees no need to auction those bands.[43] The same rationale and conclusion in those reports applies also to the 42/43 GHz band.

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41 *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*, Notice of Proposed Rulemaking and Order, 25 FCC Rcd 6996 (2010). The proposed renewal standard would include a substantial service showing and a "regulatory compliance demonstration" showing substantial compliance with the Commission's rules, policies, and the Communications Act. *Id.* at ¶ 17. The FWCC criticized this approach. *See* Reply Comments of the FWCC in Docket No. 10-112 (filed Aug. 23, 2010).

42 *Deployment of 11 GHz, 18 GHz, and 23 GHz Microwave Bands—Report Pursuant to Section 6412 of the Middle Class Tax Relief and Job Creation Act of 2012*, 27 FCC Rcd 14482 at ¶ 8 (Wireless Telecom. Bur. 2012) ("In recent proceedings, the Commission has found no factual basis for a determination that the frequency coordination regime 'leads to inefficient use of this spectrum or is otherwise no longer in the public interest.' To the contrary, the nature of microwave operations allows multiple licensees to share the frequencies in the same geographic area") (footnote omitted).

43 Letter from Mark L. Goldstein, Director, Physical Infrastructure Issues, Government Accountability Office to John D. Rockefeller IV, Chairman, and Kay Bailey Hutchison, Ranking Member, Committee on Commerce, Science, and Transportation , United States Senate and Fred Upton, Chairman, and Henry A. Waxman, Ranking Member, Committee on Energy and Commerce, House of Representatives, GAO-13-78R Spectrum Management (Nov. 20, 2012)

For all of the above reasons, the FWCC opposes area licensing for the 42/43 GHz band, and suggests the following framework instead.

### *2. Proposed service and technical rules for 42/43 GHz*

We recommend service rules for the 42/43 GHz band that are similar to those in effect for the 11, 18, and 23 GHz and other site-licensed point-to-point FS bands.

***Licensing.*** Facilities should be authorized on a link-by-link basis using the prior coordination procedures specified in Section 101.103(d). The approach achieves very dense deployments where demand is high, and thus yields highly efficient use of the spectrum.

The automated frequency coordination database used for 70/80/90 GHz is less suitable for this band. That approach entails unlimited, non-exclusive nationwide licenses, coupled with automated frequency coordination for each specific link on a first-come, first-served basis.[44] The automated coordination works because 70/80/90 GHz antennas produce narrow "pencil beams" that greatly reduce the potential for interference.[45] Applicants at 42/43 GHz, using broader beamwidths and being subject to lower free-space attenuation, will benefit from a system that provides upfront recourse to a frequency coordinator. Individual frequency coordination may also be needed to adequately protect RAS and Federal facilities.

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("FCC's current approach to assigning common carrier licenses in the 11, 18, and 23 GHz bands has generally ensured licenses in these bands are available and encouraged spectrum efficiency. . . . Without definitive information on spectrum availability in these bands, it is unclear whether there is a need for other approaches, such as the use of competitive bidding or the application of spectrum fees, to generate more revenue for the government and increase spectrum efficiency.")

[44] *Service Rules for the 71-76 GHz, 81-86 GHz and 92-95 GHz Bands*, Report and Order, 18 FCC Rcd 23318 at ¶¶ 45, 49-60 (2003), *recon. granted in part*, Memorandum Opinion and Order, 20 FCC Rcd 4889 (2005).

[45] *Id*. at ¶ 44.

***Term.*** 10 years, renewable.[46]

***Construction.*** Links must be placed in operation within 18 months of initial license grant.[47]

***Spectrum efficiency***. Above 13 GHz, the required Part 101 minimum spectrum efficiency is 1 bit/sec/Hz.[48] Although we expect 42/43 GHz radios to achieve better results in practice, we ask the Commission to apply the present requirement to 42/43 GHz while the technology matures.

***Conditional licensing***. Links at 42/43 GHz should be eligible for conditional licensing, subject to the prerequisites laid out in Section 101.31(b)(1).

***Regulatory status.*** An applicant should be permitted to specify either common carrier or private operational fixed service.

***Power***. We recommend that power limits be set at a maximum of 23 dBm in any 10 MHz of bandwidth (conducted power spectral density at the antenna flange).

***Antenna standards.*** Antennas at 42/43 GHz should be required to comply with the standards in Section 101.115(b) as applicable to 39 GHz.

***Channelization.*** We propose that the Commission authorize channel bandwidths of 30, 40, 50, 60, 80, and 100 MHz, centered as shown in the following tables. For simplicity of manufacture, the difference between transmit and receive frequencies for every channel pair is consistent throughout at 750 MHz.

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46 47 C.F.R. § 101.67.

47 47 C.F.R. § 101.63(a).

48 47 C.F.R. § 101.141(a)(1).

(1) 30 MHz bandwidth channels:

| Transmit (receive) (MHz) | Receive (transmit) (MHz) |
|---|---|
| 42030 | 42780 |
| 42060 | 42810 |
| 42090 | 42840 |
| 42120 | 42870 |
| 42150 | 42900 |
| 42180 | 42930 |
| 42210 | 42960 |
| 42240 | 42990 |
| 42270 | 43020 |
| 42300 | 43050 |
| 42330 | 43080 |
| 42360 | 43110 |
| 42390 | 43140 |
| 42420 | 43170 |
| 42450 | 43200 |
| 42480 | 43230 |
| 42510 | 43260 |
| 42540 | 43290 |
| 42570 | 43320 |
| 42600 | 43350 |
| 42630 | 43380 |
| 42660 | 43410 |
| 42690 | 43440 |
| 42720 | 43470 |

(2) 40 MHz bandwidth channels:

| Transmit (receive) (MHz) | Receive (transmit) (MHz) |
|---|---|
| 42035 | 42785 |
| 42075 | 42825 |
| 42115 | 42865 |
| 42155 | 42905 |
| 42195 | 42945 |
| 42235 | 42985 |

| | |
|---|---|
| 42275 | 43025 |
| 42315 | 43065 |
| 42355 | 43105 |
| 42395 | 43145 |
| 42435 | 43185 |
| 42475 | 43225 |
| 42515 | 43265 |
| 42555 | 43305 |
| 42595 | 43345 |
| 42635 | 43385 |
| 42675 | 43425 |
| 42715 | 43465 |

(3) 50 MHz bandwidth channels:

| **Transmit (receive) (MHz)** | **Receive (transmit) (MHz)** |
|---|---|
| 42050 | 42800 |
| 42100 | 42850 |
| 42150 | 42900 |
| 42200 | 42950 |
| 42250 | 43000 |
| 42300 | 43050 |
| 42350 | 43100 |
| 42400 | 43150 |
| 42450 | 43200 |
| 42500 | 43250 |
| 42550 | 43300 |
| 42600 | 43350 |
| 42650 | 43400 |
| 42700 | 43450 |

(4) 60 MHz bandwidth channels:

| **Transmit (receive) (MHz)** | **Receive (transmit) (MHz)** |
|---|---|
| 42045 | 42795 |
| 42105 | 42855 |
| 42165 | 42915 |

| | |
|---|---|
| 42225 | 42975 |
| 42285 | 42035 |
| 42345 | 42095 |
| 42405 | 43155 |
| 42465 | 43215 |
| 42525 | 43275 |
| 42585 | 43335 |
| 42645 | 43395 |
| 42705 | 43455 |

(5) 80 MHz bandwidth channels:

| **Transmit (receive) (MHz)** | **Receive (transmit) (MHz)** |
|---|---|
| 42055 | 42805 |
| 42135 | 42885 |
| 42215 | 42965 |
| 42295 | 43045 |
| 42375 | 43125 |
| 42455 | 43205 |
| 42535 | 43285 |
| 42615 | 43365 |
| 42695 | 43445 |

(6) 100 MHz bandwidth channels:

| **Transmit (receive) (MHz)** | **Receive (transmit) (MHz)** |
|---|---|
| 42075 | 42825 |
| 42175 | 42925 |
| 42275 | 43025 |
| 42375 | 43125 |
| 42475 | 43225 |
| 42575 | 43325 |
| 42675 | 43425 |

## H. PUBLIC INTEREST

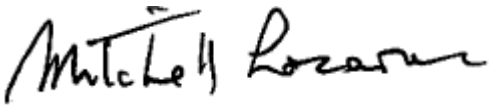
Fixed Service wireless backhaul is an essential and rapidly expanding component of the nation's communications infrastructure, needed to support a wide range of voice and data services. The Commission recently acknowledged the crucial importance of point-to-point microwave links as a "cost-effective alternative to traditional copper circuits and fiber optic links," noting that "[i]n certain rural and remote locations, microwave is the only practical high-capacity backhaul solution available."[49] All data sent to or from a mobile device must pass over a backhaul connection. While some of those connections can use fiber-optic cable, that option is disproportionately expensive for many installations, both in rugged rural terrain and in built-up urban areas. In many such cases, microwave links may be the best (or only) choice. In urban environments, where needed links tend to be short, frequencies in the region above 40 GHz are ideal. We urge the Commission to implement the requested reallocation and adopt practical service rules that will make these frequencies available.

[49] *Amendment of Part 101 of the Commission's Rules to Facilitate the Use of Microwave for Wireless Backhaul and Other Uses*, Report and Order and Notice of Proposed Rulemaking, 26 FCC Rcd 11614 at ¶ 1 (2011).

## CONCLUSION

The Commission should adopt a Further Notice of Proposed Rulemaking, based on the above suggestions, at the earliest possible date.

Respectfully submitted,



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February 11, 2013

## TECHNICAL CERTIFICATION

I am a technically qualified person who reviewed the foregoing Petition for Rulemaking. I certify that the technical statements therein are correct to the best of my knowledge.

Larrie Sutliff

Larrie Sutliff
Chairman, Technical Committee
Fixed Wireless Communications Coalition, Inc

February 11, 2013

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