

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554**

In the Matter of)	
)	
Expanding Flexible Use of the 3.7 to 4.2 GHz Band)	GN Docket No. 18-122
)	
Expanding Flexible Use in Mid-Band Spectrum)	GN Docket No. 17-183
Between 3.7 and 24 GHz)	(Inquiry Terminated as to 3.7-4.2 GHz)
)	
Petition for Rulemaking to Amend and Modernize)	RM-11791
Parts 25 and 101 of the Commission’s Rules to)	
Authorize and Facilitate the Deployment of)	
Licensed Point-to-Multipoint Fixed Wireless)	
Broadband Service in the 3.7-4.2 GHz Band)	
)	
Fixed Wireless Communications Coalition, Inc.,)	RM-11778
Request for Modified Coordination Procedures in)	
Band Shared Between the Fixed Service and the)	
Fixed Satellite Service)	
)	

COMMENTS OF STARRY, INC.

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COMMENTS OF STARRY, INC.

Starry, Inc. (Starry)¹ respectfully submits these comments in support of the Federal Communications Commission's (FCC or Commission) proposals to increase the intensity of terrestrial use of the 3.7-4.2 GHz band.² As the Commission recognizes, this band is incredibly valuable for both fixed and mobile broadband in the context of 5G and beyond.³ We support the Commission's fact-based examination of how to best increase the use of the band for fixed and mobile terrestrial operations while protecting incumbent operations that must remain in the band.

¹ Starry, Inc., is a Boston- and New York-based technology company that is utilizing millimeter waves to re-imagine last-mile broadband access as an alternative to fixed wireline broadband. Starry is currently deploying its proprietary fixed 5G wireless technology in the Boston, Washington, DC, Los Angeles, and Denver areas, with plans to expand to our presence to additional U.S. cities in 2018.

² Expanding Flexible Use of the 3.7 to 4.2 GHz Band; Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz; Petition for Rulemaking to Amend and Modernize Parts 25 and 101 of the Commission's Rules to Authorize and Facilitate the Deployment of Licensed Point-to-Multipoint Fixed Wireless Broadband Service in the 3.7-4.2 GHz Band; Fixed Wireless Communications Coalition, Inc., Request for Modified Coordination Procedures in Band Shared Between the Fixed Service and the Fixed Satellite Service; *Order and Notice of Proposed Rulemaking*, GN Docket No. 18-122, GN Docket No. 17-183 (terminated as to 3.7-4.2 GHz), RM-11791, RM-11778, FCC 18-91 (rel. July 13, 2018) (*C Band Order and NPRM*).

³ *Id.* at ¶ 5.

We are also encouraged by the Commission’s programmatic approach to examining this band. Clarity about the actual needs of stakeholders, without predetermining an outcome, will derive a record that best reflects the optimal possible solutions.

To that end, we encourage the Commission to approach this proceeding with three goals: 1) protect incumbent services only to the extent necessary from a technical and economic opportunity standpoint; 2) make a meaningful amount of spectrum available for fixed point-to-multipoint services, recognizing that both fixed and mobile are part of a robust wireless broadband and 5G ecosystem; and 3) adopt flexible technical rules for fixed point-to-multipoint services that encourage efficiency but also allow technology to evolve over time.

I. THE 3.7-4.2 GHz BAND IS HIGHLY-USEFUL FOR NEXT GENERATION FIXED AND MOBILE NETWORKS

As the Commission recognizes, governments around the world are making mid-band spectrum a centerpiece of their 5G strategies.⁴ The United Kingdom, Italy, and South Korea have already assigned spectrum in parts of the 3500-4200 MHz band as part of their core 5G efforts.⁵ These countries are all motivated by the fact that mid-band spectrum is increasingly valuable as capacity spectrum for both fixed and mobile networks.

Fixed operators have traditionally utilized spectrum bands that were not targeted for mobile use, for at least two reasons. First, mobile spectrum licenses tend to be too expensive at auction for non-mobile operators to justify and are largely unavailable in the secondary market. Second, mobile bands tended to be those that were optimized more for coverage than capacity, while fixed spectrum bands tend to optimize more for capacity over coverage.

The 3.7-4.2 GHz band, however, is a spectral sweet spot in which both fixed and modern mobile networks can derive significant utility. On the fixed side, the possibility of wide bandwidths, spectral re-use, and propagation through physical obstacles makes the band incredibly useful as a layer in site-based licensed, gigabit capable, fixed point-to-multipoint networks. And precisely the same characteristics make it useful for mobile broadband, particularly for layered capacity in high-use areas.

⁴ *Id.* at ¶ 6.

⁵ See Sacha Kavanagh, 5G UK AUCTION, 5G.CO.UK (June 11, 2018), <https://5g.co.uk/guides/5g-uk-auction/>; Juan Pedro Tomás, ITALIAN GOVERNMENT RAISES \$7.5 BILLION IN 5G AUCTION, RCR Wireless News (Oct. 3, 2018), <https://www.rcrwireless.com/20181003/5g/italian-government-raises-billion-5g-auction>; MSIT ANNOUNCES RESULT OF 5G SPECTRUM AUCTION, TeleGeography (June 19, 2018), <https://www.telegeography.com/products/commsupdate/articles/2018/06/19/msit-announces-results-of-5g-spectrum-auction/>.

At the same time, modern satellite innovation and development is taking place in bands far above the 3.7-4.2 GHz band. This is likely because the satellite industry continues to enhance its technology to better compete with terrestrial fixed broadband in capacity and latency, and therefore is focused on lower-orbit small satellite constellations in higher frequency bands. Content deliver is the primary existing use case that has been identified for the continued use of the 3.7-4.2 GHz band for fixed satellite service (FSS).⁶

With increasing utility for terrestrial fixed and mobile operations and decreasing value in FSS applications, it is prudent for the Commission to consider the ways to optimize the use of this spectrum in the public interest. The Commission's mandate is not to protect existing spectrum users into perpetuity in the name of predictability and certainty in vested spectral rights. It is to continually examine whether a current use is the best use in servitude of the public interest, or whether the benefits of enabling a new technology outweigh the costs of transitioning – in some manner – an incumbent use case.

The availability of wide channel bandwidths in the 3.7-4.2 GHz band will enable gigabit-capable fixed and mobile broadband services. With at least 40 megahertz, a single fixed provider could achieve real-world gigabit speeds to multiple users simultaneously through beamforming and MIMO techniques. Further, the technology ecosystem being developed for the Citizens Broadband Radio Service (CBRS) could readily be adapted to this band, along with new 5G NR, LTE, 802.11, or other technologies. In short, with quick Commission and FSS incumbent action, this band could be put into use for fixed broadband almost immediately once made available, directly benefiting consumers across the country and helping the U.S. maintain its leadership position in wireless through the transition to 5G.

II. INCUMBENT PROTECTION SHOULD BE BASED ON REAL-WORLD CHARACTERISTICS AND SHOULD BE PHASED OUT OVER TIME AS APPROPRIATE

Starry supports the Commission's efforts to stabilize the spectral environment in this band and to gather detailed data on the current incumbent uses. Any incumbent that might be transitioned out of band – either by mandate or voluntarily – is incentivized to overstate the encumbrance of their incumbency to maximize the cost of clearing.⁷ The Commission should, to

⁶ *C Band Order and NPRM* at ¶ 10; Comments of Verizon, GN Docket No. 17-183 at 18 (filed Oct. 2, 2017); Comments of Nokia, GN Docket No. 17-183 at 12 (filed Oct. 2, 2017); Joint Comments of Intelsat and Intel, GN Docket No. 17-183 at 17 (filed Oct. 2, 2017) (Intelsat / Intel Comments).

⁷ See *C Band Order and NPRM* at ¶ 59.

the greatest extent possible, exercise its authority to gain as much detail about the incumbents' *actual* use of the band to make an informed decision about how best to increase the intensity of terrestrial operations.

We note that this data could in fact show that the incumbent FSS use is more widespread than the existing record shows. We also note, however, that the fact that the FSS operators are supportive of at least some transition of the band to terrestrial users⁸ suggests strongly that there is significant value to be extracted that outweighs the cost of the equivalent FSS transition and relinquishment of rights.

We support the Commission's collection of both earth station information (fixed and transportable) and space station information, including usage information.⁹ We also support the Commission's proposals to validate the data, to limit new earth stations and space stations, and to remove uncertified earth stations from the International Bureau Filing System.¹⁰ This will help ensure that the dataset on which both the Commission's decisions and any private-market transactions reveals accurate information to the greatest extent possible. Furthermore, requiring that this information be kept up to date will enable greater use of the band over time if incumbent uses decline in favor of other technological solutions and services.

We also support the proposal to base coordination of protected earth stations on real-world information regarding those earth stations, moving away from the antiquated "full band, full arc" protection criteria.¹¹ The Commission decided to base earth station protections on similar real world characteristics in CBRS, and we believe it should do the same here.¹² This proceeding is specifically focused on increasing the intensity of the use of the band by the users that value it the most – this naturally requires accurate information about the current operations that must be protected or that may transition.

Finally, we agree with the proposal to sunset existing point-to-point fixed services in the band.¹³ If the Commission adopts its proposal to enable fixed point-to-multipoint operations in the upper portion of the band, existing fixed point-to-point users can transition into the new

⁸ See C-Band Alliance Proposal Fact Sheet: October 22 Update (C-Band Alliance Update), <http://www.intelsat.com/wp-content/uploads/2018/10/CBand-Alliance-Fact-Sheet.pdf>.

⁹ *C Band Order and NPRM* at ¶¶ 16-25.

¹⁰ *Id.* at ¶¶ 30-36.

¹¹ *Id.* at ¶¶ 37-45.

¹² See 47 C.F.R. § 96.17.

¹³ *C Band Order and NPRM* at ¶¶ 47-48.

point-to-multipoint regime over time. Ultimately, we strongly believe that the Commission's proposals regarding incumbent users will promote stability in the spectral environment and data-driven decision making, and should be adopted.

III. ROBUST FIXED POINT-TO-MULTIPOINT SHOULD BE AUTHORIZED ON A SHARED BASIS IN AT LEAST 160 MEGAHERTZ

As the Commission recognizes and the record in response to the *Mid-Band NOI*¹⁴ shows, the 3.7-4.2 GHz band has physical characteristics that can facilitate high-capacity fixed broadband.¹⁵ Specifically, the ability to operate in wide channels coupled with the ability to transmit through obstacles makes this a powerful band to help increase broadband access and competition. When combined with other bands – including CBRS, 5 GHz, 6 GHz, and millimeter wave (mmW) bands – a fixed operator will have a robust set of spectrum tools to deploy a highly-competitive and agile fixed network that can scale economically across geographies and household densities, bringing new access and competition to consumers across the country.

There are parallels between the methods for enabling intensive fixed use in this band and the sharing regime that Starry supports in the 37-37.6 GHz band.¹⁶ There are also parallels with the existing rules for the CBRS band.¹⁷ And of course, there are valuable characteristics from the existing Part 101 licensing and coordination process. We encourage the Commission to distill concepts and tools from each of these to create a robust sharing regime for shared fixed point-to-multipoint operations that facilitates near term access, and evolves over time.

Specifically, we support:

- maximizing the amount of spectrum for fixed point-to-multipoint;
- using a 40 megahertz channelization;
- allowing time division duplexing (TDD) without prescriptive technical rules to protect potential frequency division duplexing (FDD) systems;
- site-based protections built from actual deployment characteristics;
- protection of client devices without individual registrations; and
- technical rules that drive towards more efficient use of the band over time without overly-restricting the development of new technologies and services.

¹⁴ Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz, GN Docket No. 17-183, *Notice of Inquiry*, 32 FCC Rcd 6373 (2017) (*Mid-Band NOI*).

¹⁵ *Id.* at ¶¶ 39-53.

¹⁶ Comments of Starry, Inc., GN Docket No. 14-177 (filed Sept. 10, 2018).

¹⁷ *See, e.g.*, 47 C.F.R. Part 96.

A. The Commission Should Make at Least 160 Megahertz Available and up to 320 Megahertz with a 40 Megahertz Channelization

The Commission's proposals to increase the intensity of terrestrial use without fully clearing the band recognizes that there is potentially some value in maintaining FSS operations, as FSS operators argue.¹⁸ As a starting point in this negotiation, the FSS operators have suggested that they could free up to 200 megahertz for new flexible use services if certain conditions are met, while continuing to operate in the remainder of the band.¹⁹ Taking the baseline argument at face value – that FSS must continue to operate in some portion of the band – we strongly support the Commission's proposal to unlock the still-encumbered spectrum for much more intensive fixed terrestrial/FSS sharing.

Fixed services should be permitted on a shared point-to-multipoint basis in any portion of the band not determined to be available for exclusive-use licensing. That should begin as close to the flexible use portion of the band as technically feasible and extend upward to the 4.2 GHz band edge. The use of a guard band should be based purely on the technical need to ensure coexistence between terrestrial flexible use, FSS, and terrestrial point-to-multipoint near the band edge. Furthermore, the Commission should leverage the existing technical tools it uses to govern interactions at the band edge between spectrally and geographically-adjacent users as much as possible, instead of overly protective guard bands.

We also encourage the Commission to create a shared underlay in the flexible-use portion of the band. Using the sharing tools for the point-to-multipoint portion of the band, the Commission can further achieve its goal of increasing the intensity of the use of the band by authorizing shared opportunistic access to unused portions of the flexible-use portion of the band. Of course, all opportunistic sharing would only be authorized on a non-interference basis and only in the frequencies or geographies unoccupied by a flexible-use licensee.

We believe that the band should be at a minimum 160 megahertz wide, and ideally up to 320 megahertz. Functionally, all spectrum that is not made available for terrestrial flexible use should be made available on a shared basis between FSS and terrestrial fixed operations. The implication that some spectrum should be left aside for the possibility that flexible use may continue to expand over time ignores the fact that the market-mechanism itself should be able to

¹⁸ See Intelsat / Intel Comments.

¹⁹ C-Band Alliance Update.

determine current and future demand. The most likely scenario in which FSS continues to shrink in the band in favor of flexible use is that the FSS use case disappears altogether. If that is an expected outcome, it should be built into and facilitated by the market-based mechanism.

Finally, we support using an unpaired 40 megahertz channelization scheme.²⁰ In these frequencies, we believe 40 megahertz is the minimum necessary to achieve the speeds necessary to offer a competitive fixed broadband service. Starting with 40 megahertz with the ability to aggregate up to and above 80 megahertz would allow a provider to offer real gigabit speeds, particularly when using a multi-user MIMO implementation with many spatial streams (16 and up).

B. Coordination and Protection Should be Founded on the Actual Characteristics of a Deployment

We support the Commission's proposal to use site-based registration and protection for point-to-multipoint deployments. Basing the coordination and registration on existing tools, like Part 101, enhanced to reflect more modern coordination, will facilitate robust deployment in the band.

Site-based coordination and registration should as much as possible account for the actual technical characteristics of the base station on which the registration and coordination is based. While a base station in these bands may have less overall directionality than in mmW bands, there is still a predictable pattern from every base station that would allow for a tailored protection and coordination zone to be drawn from each base station. Providers would have the ability to register multiple sectors, thereby creating a 360-degree sector that reflects the modeled propagation of that site.

We support the Commission using site-specific information including the height, antenna gain, power, and other details to model the propagation of a site for coordination among fixed users and protection for FSS incumbents.²¹

The customer premises equipment that communicates back to the base station should be automatically authorized within the protection zone established by the base station. We also agree with the Commission that some reasonable assumptions should be made about the quantity

²⁰ See *C Band Order and NPRM* at ¶¶ 118-119.

²¹ *Id.* at ¶¶ 120-124.

of customer premises equipment associated with a base station for the purpose of FSS coordination.²²

In the extremely unlikely event that exhaustive coexistence analyses objectively show that sharing between FSS and fixed point-to-multipoint is only feasible with restrictions that make the band largely unavailable for fixed services,²³ we suggest the Commission consider alternative authorization mechanisms. For instance, the Commission could explore ways to provide the FSS operators an economic incentive to share by allowing them to capture some of the economic value of new fixed uses either purely as spectrum monetization, or more fairly, to offset the cost of facilitating shared access. In that event, the FSS operators could both extract some economic value plus exercise greater control over the coordination between FSS and fixed systems.

C. The Technical Rules Should Be Flexible and Should Promote Efficiency

We support the Commission's proposal to authorize TDD operations in the band. TDD is the optimal solution for fixed services since it allows the operator to flexibly apportion up and down link bandwidth to optimize for customers' use. We suggest that it need not prescribe rules to govern coexistence between TDD and FDD – the industry and equipment vendors should be left to determine the optimal implementations and coexistence between system types (if there is divergence between TDD and FDD). Further, the Commission should learn from the issues created with overly prescriptive technical rules for microwave services in Part 101 (and other services/rule parts) and their inability to evolve over time, and should instead set efficiency-oriented rules that allow technology to evolve without requiring changes to Commission rules.

IV. CONCLUSION

Starry strongly supports the Commission's efforts to increase the intensity of terrestrial use of the 3.7-4.2 GHz band, and its fact-driven proposals and inquires. We believe that the Commission can significantly enhance terrestrial use by protecting incumbent operations based on actual deployment information, making at least 160 megahertz available for fixed point-to-

²² *Id.* at ¶ 122.

²³ There should be no basis on which the Commission should conclude that the band cannot be shared between FSS and fixed point-to-multipoint operations. This is not a binary question. Instead, the question is what is the protection criteria, how does it impact the utility for fixed, and what tools could be leveraged to mitigate interference (technical or financial). Existing evidence on the record from Google and the Broadband Access Coalition strongly shows that the band can in fact be shared between fixed and FSS operations. *See Ex Parte Presentation, Google and Broadband Access Coalition, GN Docket No. 17-183 (filed Mar. 29, 2018).*

multipoint service, and adopting flexible technical rules to allow a robust technology ecosystem to develop and evolve over time.

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