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VIA ECFS

Marlene H. Dortch, Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, DC 20554

Re: *Ex Parte* Communication
Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz, GN Docket No. 17-183; *MVDDS 5G Coalition Petition for Rulemaking to Permit MVDDS Use of the 12.2-12.7 GHz Band for Two-Way Mobile Broadband Service*, RM-11768

Dear Ms. Dortch,

AT&T Services, Inc., on behalf of the subsidiaries and affiliates of AT&T Inc. (collectively, "AT&T"), hereby submits this *ex parte* response to the MVDDS 5G Coalition (the "MVDDS Coalition" or "Coalition") *ex parte* filing dated February 5, 2018 in the above-referenced Mid-Band Proceeding (the "Coalition *Ex Parte* Filing"). The Coalition proposes to eviscerate the carefully-drawn interference protection framework for the 12.2-12.7 GHz Multichannel Video and Data Distribution Service ("MVDDS") to permit mobile, two-way operations. In so doing, the Coalition proposes to cause significant harm to Direct Broadcast Satellite ("DBS") service relied upon by tens of millions of customers, a result plainly contrary to the public interest. In its Comments and Reply pleadings in the above-referenced Public Notice as well as in its February 5 submission, the Coalition offers a technical justification ostensibly in support of its proposal.[1] AT&T takes this opportunity to respond to and rebut the numerous flawed premises, faulty assumptions, and internal inconsistencies contained in the Coalition's technical advocacy. Appendix A attached hereto addresses, point-by-point, the errors contained in the Coalition's technical filing and why the filing does not support the policy changes requested.

Not only is the Coalition's technical analysis fundamentally unsound, but there also exist ample technical and policy reasons for the Commission to prohibit two-way mobile communications in the 12.2-12.7 GHz band. First, it is well-established as a technical matter that terrestrial mobile and consumer satellite receivers often cannot coexist on a co-channel basis without rigorous coordination. Because satellite receivers are highly sensitive and designed to receive very low power distant signals, terrestrial mobile signals will overload nearby consumer

[1] Comments of the MVDDS 5G Coalition, RM-11768 (June 8, 2016) ("MVDDS 5G Coalition Petition Comments"); Reply Comments of the MVDDS 5G Coalition, RM-11768 (June 23, 2016) ("MVDDS 5G Coalition Petition Reply Comments").

satellite receivers if they are co-channel (or even adjacent-channel). And, in this case of both terrestrial mobile 5G MVDDS devices and consumer DBS receivers, devices would be ubiquitously deployed, constantly moving, and in close proximity. Further, the mobile signal, by its very nature, would be transient, making detection and demonstration of any interference suffered by DBS receivers extremely difficult. The Commission has recognized this fundamental incompatibility in numerous prior proceedings. Second, the Coalition's proposal represents an attempt to circumvent the protections that were afforded to DBS operations after a careful, time-consuming, and exhaustive coexistence analysis by the Commission of terrestrial and DBS services in the band.[2] Third, when considering the Coalition's Petition, the Commission must take into account the changed competitive motivations of DISH – the largest MVDDS licensee – and DISH's current incentives to contradict the previous statements it has made about the compatibility of DBS and terrestrial mobile or higher power operations. DISH appears to be both attempting to reap a speculative windfall from its spectrum investments and undercut competition in the DBS market.

The Incompatibility of Co-Channel Terrestrial Mobile and Consumer Satellite Operations is Well-Established. It is well-understood that terrestrial mobile and consumer satellite receivers cannot typically coexist in the same (or adjacent) spectrum, particularly where, as here, devices will be ubiquitously deployed and in close proximity. The Commission has noted this incompatibility on numerous occasions, finding that "same-band, separate operator sharing is impractical and ill-advised."[3] The Commission has cited this concern in numerous past proceedings, including when allocating the AWS-4 spectrum[4] and where it determined that permitting MSS licensees to operate ancillary terrestrial component operations was preferable to separate-operator sharing.[5] Notably, the Commission has also expressed concern regarding the compatibility of terrestrial mobile and satellite service even when the services were in *adjacent* channels; for example, the FCC also reached a consistent conclusion when addressing concerns

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[2] The MITRE Corporation, "Analysis of Potential MVDDS Interference to DBS in the 12.2-12.7 GHz Band" (filed April 18, 2001) ("MITRE Report").

[3] *Flexibility for Delivery of Communications by Mobile Satellite Service Providers,* Report and Order and Further Notice of Proposed Rulemaking, 18 FCC Rcd 11030, ¶ 49 (2003) ("*ATC Report and Order*"). *See also id.* ("As a preliminary matter, we find that references to sharing arrangements in other bands, while illustrative that sharing may be possible, particularly where both services operate in limited geographic areas on a fixed basis, do not address how parties to this proceeding can overcome the technical hurdles to workable sharing arrangements between two mobile services. The feasibility of any given satellite-terrestrial sharing arrangement in any given frequency band depends upon inter-related factors including: propagation characteristics of the frequency band, mobility of the communication end points, geographic separation between users, anticipated operating power, protection of adjacent spectrum users from interference, extent of system deployment across territory, and other particulars.").

[4] *See, e.g., Service Rules for Advanced Wireless Services in the 2000-2020 MHz and 2180-2200 MHz Bands,* Report and Order and Order of Proposed Modification, 27 FCC Rcd 16102, ¶ 181 (2012) ("*AWS-4 Report and Order*") ("The Commission previously determined that separately controlled MSS and terrestrial operations (i.e., two ubiquitous mobile services) in the same band would be impractical because the parties would not be able to overcome the technical hurdles to reach a workable sharing arrangement. . . . This determination suggested that the public interest would be best served by modifying the 2 GHz MSS license to allow the satellite licensee to operate terrestrial services, rather than make the band available for terrestrial licenses under a sharing regime with MSS. As discussed below, the record demonstrates that the earlier Commission conclusion regarding the impracticality of allowing same spectrum, different operator use of the AWS-4 spectrum remains valid.").

[5] *ATC Report and Order* at ¶ 79.

of interference caused by LightSquared to GPS receivers.[6] Obviously, technical compatibility issues are exacerbated where, as here, the interfering services are co-channel.[7]

Not only has this dynamic played out in numerous other spectrum bands, but the Commission also specifically acknowledged this issue when declining to authorize two-way terrestrial operations in the 12.2-12.7 GHz band in 2002. Specifically, the Commission stated that "we believe that two-way services in the band without relocating the upstream path would significantly raise the potential for instances of interference among the operations."[8] Notably, the Commission has stated that the current 12.2-12.7 GHz sharing regime only works because the services in question were "stationary services that use highly directional fixed antennas."[9] Here, the Coalition proposes to convert MVDDS to a two-way mobile service, and in many respects DBS service, writ large, is analogous to a mobile service. There are tens of millions of DBS receivers deployed throughout the U.S., with new receivers being added, removed, and moved every day. DBS customers are free to relocate their receivers at any time, whether because they are moving to a new address or because they simply wish to move their receiver to a different location on their property—DBS dishes, in fact, are not uncommon to see on Recreational Vehicles and long haul trucks. Different-operator, same-spectrum sharing between terrestrial and satellite operations is typically only feasible where one or both services is fixed and highly directional, and where strict technical rules are put into place to prevent harmful interference. As explained further below, the Coalition proposes to enable mobile MVDDS 5G services while eviscerating the existing interference protection rules in a single stroke. The Commission must reject this proposal.

The Coalition Seeks to Circumvent Carefully-Crafted Interference Protections to the Detriment of DBS Licensees and Their Customers. The Coalition's request essentially seeks reconsideration of a decision made over a decade ago adopting carefully crafted protections designed to ensure the successful operation of DBS services. As the record amply demonstrates—and as the Coalition again acknowledges—MVDDS operations were authorized subject to a strict non-interference policy with respect to DBS operations.[10] For example, an MVDDS licensee must cease operation if it is unable to correct harmful interference to a DBS customer of record or if the MVDDS signal exceeds the permitted EPFD level at the DBS customer location.[11] These rules were developed based on an independent technical assessment of coexistence between terrestrial and DBS systems.[12] The MITRE Report indicated that

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6 *International Bureau Invites Comment on NTIA Letter Regarding LightSquared Conditional Waiver,* Public Notice, DA 12-214 (2012).

7 *See, e.g., AWS-4 Report and Order* ¶ 149 ("Further, although we are not adopting rules limiting the operations of MSS mobile transmitters, the proximity of uplink and downlink operations also raises the potential for 1995-2000 MHz band base stations to interfere with MSS satellite receivers.").

8 *See Amendment of Parts 2 and 25 of the Commission's Rules to Permit Operation of NGSO FSS Systems Co-Frequency with GSO and Terrestrial Systems in the Ku-Band Frequency Range,* Memorandum Opinion and Order and Second Report and Order, 17 FCC Rcd 9614, ¶ 137 (2002) ("*Second Report and Order*").

9 *ATC Report and Order* at ¶ 50.

10 *See* Tom Peters, "MVDDS 12.2-12.7 GHz Co-Primary Service Coexistence" at 7 (June 8, 2016), attached to MVDDS 5G Coalition Petition Comments ("Technical Study I").

11 47 C.F.R. § 101.1440(g).

12 *See* MITRE Report.

"MVDDS sharing of the 12.2-12.7 GHz band currently reserved for DBS poses a significant interference threat to DBS operation in many realistic operational situations." The report goes on to conclude that "MVDDS/DBS band sharing appears feasible if and only if suitable mitigation measures are applied."[13] The Coalition's proposal offers no technical analysis that would suggest the MITRE Report is no longer relevant, yet would do away with the carefully-crafted mitigation measures derived from the Report. Not only would the Coalition's proposal eliminate the unidirectional, equivalent isotopically radiated power ("EIRP") limits that are vital to protecting DBS operations from interference, but its proposal also would have the effect of rendering EPFD analysis – and confirmation of compliance with EPFD limits – impossible to model. This would also have the effect of shifting the burden of interference mitigation from MVDDS licensees to DBS licensees.

In their zeal to revise the rules, the MVDDS Coalition attempts to downplay the need for continued limits on EIRP. The Coalition claims that these rules are unnecessary and "duplicative" of the EPFD limits also contained in the rules.[14] However, the EIRP limits were established specifically to mitigate the potential impact of MVDDS operations on future DBS customers. Indeed, as the Commission explained, "placing a limit on MVDDS EIRP will ensure that DBS entities are not unduly hindered in their ability to acquire customers in areas in close proximity to MVDDS transmit facilities" and "higher power may cause too great of an exclusion zone for future DBS and NGSO FSS subscribers."[15] The MVDDS Coalition's call to eliminate the EIRP limits would fly in the face of this acknowledged need to protect the ability of DBS operators to serve these future customers.

Furthermore, by permitting mobile operations in the band, the Commission would make it impossible for parties to rely upon EPFD modeling as a means of predicting and mitigating interference. It would be impossible to account for and simulate the location of a mobile 5G MVDDS receiver, and thus EPFDs could not be modeled at all—which means interference to DBS receivers could not be predicted and avoided. Furthermore, a mobile terrestrial signal is, by definition, transient. Interference experienced by a DBS customer from that mobile emitter would be exceptionally difficult for the DBS operator to trace or identify as the MVDDS transmitter moves. As a result, the Commission's existing rule requiring MVDDS licensees to protect DBS "customers of record" for one year following MVDDS deployment would be essentially impossible to enforce. Scenarios where a mobile MVDDS transmitter, such as a mobile customer's 5G device, would cause interference to a DBS antenna are not just hypothetical constructs. In a mobile environment there are many possible use cases that would involve a mobile 5G MVDDS device coming into line-of-sight proximity to a DBS receiver – *e.g.*, on the balcony of an apartment building. In such a scenario, the 5G mobile emitter would have no way to recognize the presence of a DBS receiver and thus would not be able to reduce power or terminate transmission to comply with EPFD limits. In short, EPFD modeling can be a critical tool in preventing interference, but only when transmitters are fixed. In a mobile environment, this important interference prevention tool is rendered essentially useless.

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13 *Id.* at xvi-xvii.

14 *See, e.g.,* MVDDS 5G Coalition Petition Comments at 5-7.

15 *See Second Report and Order* at ¶ 198; *see also In the Matter of MDS Operations, Inc.,* WT Docket No. 07-255, 25 FCC Rcd 7693, 7967 (WTB 2010).

Finally, the MVDDS Coalition requests—by implication—that the burden of interference management be shifted away from MVDDS licensees onto DBS licensees. The MVDDS Coalition has proposed to eliminate the existing interference mitigation framework and suggests no proposed replacement. That the Coalition would take this position is not surprising – the site surveys required under the current rules would be impractical if two-way mobile communications were permitted. Rather than acknowledge that MVDDS operators would have no means to predict interference to DBS customers and that DBS operators would have limited means to measure and record harmful interference from mobile transmitters, the Coalition simply ignores potential interference effects of two-way mobile use in favor of highlighting less complex deployment scenarios.[16] Because grant of the MVDDS Coalition's proposal would eliminate rules designed to prevent interference to DBS customers, grant of the proposal would implicitly shift the burden of interference management to DBS providers and their subscribers. With few interference protections remaining for DBS, DBS providers would be required to track interference to their customers, demonstrate interference from 5G mobile emissions, and work with potentially unwilling third parties to resolve interference disputes. However, because it is inherently difficult to identify the exact source and/or location of interference from mobile operations, there may be no way to develop mitigation procedures to prevent similar interference occurrences in the future. Thus, DBS operators would essentially be ceding their interference rights to mobile MVDDS operations. And in the instances where the source of interference could be identified, it is likely that many disputes would be escalated to the Commission, requiring the expenditure of considerable time and resources by all parties.

Placing interference mitigation burdens on DBS operators for a consumer service is particularly poor public policy. First, consumers may not understand that newly-created interference is unlawful and may simply (and incorrectly) assume the declining performance is attributable to declining quality by the DBS provider. Second, even if consumers were well-educated enough to recognize interference when it occurs, they have no means to identify the source of the interference and seek protection.

DISH's Dramatically Changed Incentives Undercut Its Arguments in Support of the Coalition's Proposal. The MVDDS Coalition seeks to support its arguments that there will be no meaningful impact on DBS operations by arguing that DISH, a DBS operator, is a member of the Coalition and would not do anything that would undercut DBS service.[17] Yet, the Coalition's statements regarding the ability of MVDDS to protect DBS customers are at odds with DISH's prior positions. Indeed, prior to becoming an MVDDS licensee, DISH repeatedly stressed the importance of protecting DBS from MVDDS-caused interference and the need to enforce EIRP limits and other interference protections.[18] DISH also strenuously opposed what it believed were opportunistic attempts by MVDDS licensees to use Commission procedures to reap a windfall on their spectrum to the detriment of DBS licensees.[19] Indeed, DISH stressed in 2009 that

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[16] *See* Attachment A, *infra.*

[17] *See, e.g.,* MVDDS 5G Coalition *Ex Parte* at 5.

[18] *See* Opposition of EchoStar Satellite L.L.C., WT Docket No. 07-255 (filed Dec. 19, 2007); *Ex Parte* filing of DISH Network, WT Docket No. 07-255 (filed May 16, 2008).

[19] Letter from Linda Kinney, DISH, to Marlene H. Dortch, FCC, ULS File No. 0003516339, at 2 (July 10, 2009) ("It would not, however, be appropriate to manipulate this five-year benchmark process to fundamentally

"MVDDS licensees should not be permitted to capitalize on their lack of deployment and investment by increasing their transmitter power to harmful levels, shortchanging the critical DBS/MVDDS coordination process, or decreasing the essential protection afforded DBS consumer dishes under Commission rules,"[20] and that "the Commission should not reward such regulatory gamesmanship."[21]

What has changed from those prior views is not the importance of the carefully crafted rules designed to protect DBS service, but rather the fact that DISH now holds a very different position in the marketplace. When it made its prior statements about harmful interference and regulatory opportunism in 2007 and 2009, DISH was concerned solely with protecting its DBS operations. In subsequent years, however, DISH has become the single largest licensee of MVDDS spectrum, now holding 82 of 213 active licenses,[22] including 71 licenses in the top 100 markets. DISH is not merely a member of the MVDDS Coalition, but, as the owner of MVDDS licenses in most of the major markets, is a driving force behind it and will reap the greatest benefit if the Coalition's request is granted. In addition, DISH has developed an alternative means of video programming distribution – Sling – that does not require DBS capabilities. In other words, DISH may have less incentive to protect DBS operations than it once did. At a minimum, DISH would now balance the impact of the Coalition's proposals on its existing and future DBS subscriber base against the advantages – arguably very profitable ones for existing MVDDS licensees – that would flow to its other services if the request is granted.

But it is important to note that the laws of physics have not changed. Nor has the public interest in protecting tens of millions of DBS consumers from harmful interference. The only changed circumstances here are DISH's acquisition of MVDDS spectrum and its consequent reassessment of its self-interest. To be sure, the Commission has noted the rare exception to the fundamental principle that terrestrial mobile and consumer satellite receivers generally cannot coexist in the same spectrum – that management of interference may be possible when the same entity controls both the satellite and terrestrial operations.[23] But there is no exception to that fundamental principle here. In this band, no single entity controls both the satellite and terrestrial operations. Indeed, there are multiple MVDDS licensees and competing DBS providers as well. Thus, interference to DBS services is not only predictable, but certain to occur should mobile terrestrial operations be permitted in the 12.2-12.7 GHz band. Accordingly, the FCC's duty also remains unchanged—it has a duty to prevent such harmful interference.

In conclusion, technical and policy considerations weigh against grant of the Coalition proposal. As explained in the attached Appendices, the Coalition's technical justification for its request is premised upon myriad inaccuracies and faulty assumptions. Furthermore, grant of the

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change the operating parameters of the MVDDS service and the DBS/MVDDS sharing rules, or reward providers that have not taken efforts to invest in their licenses.").

20 *Id.* at 1.

21 Reply of DISH Network L.L.C., ULS File No. 0003516339, at 2 (July 27, 2009).

22 DISH's licenses are held through two subsidiaries: DISH Network L.L.C. (45 licenses) and SOUTH.COM LLC (37 licenses).

23 *AWS-4 Report and Order* at ¶ 181.

Coalition's proposal would result in considerable interference to DBS operations and harm to tens of millions of consumers.

Please address any questions to the undersigned.

Sincerely,

/s/ Michael P. Goggin

Michael P. Goggin

Attachments

Appendix A

AT&T Response to the MVDDS 5G Coalition Technical Studies

The MVDDS 5G Coalition submitted two technical studies ("Technical Studies") purporting to demonstrate that two-way mobile services could be deployed in the 12.2-12.7 GHz band without causing harmful interference to DBS customers.[1] As described below, the technical studies are flawed because they employ inaccurate assumptions and/or rely upon highly selective use cases.

I. CERTAIN BASELINE ASSUMPTIONS MADE BY THE COALITION ARE FLAWED.

A. The Study Overstates the Extent, Permanence, and Predictability of Areas Where DBS Receivers Cannot be Successfully Installed.

The Coalition's technical studies too narrowly and simplistically define the areas in which a DBS receiver could establish a direct line-of-sight path with DBS satellite orbital locations. The ensuing EPFD analyses were conducted at an underinclusive set of locations and thus fail to consider all relevant DBS receivers.

First, the Coalition's assumption that DBS receivers would be on rooftops having a pitch of less than 35 degrees cannot be applied universally and permanently.[2] In fact, some DBS antennas may be side-mounted on buildings or on ledges or balconies – not just on rooftops. Moreover, building construction projects frequently change the three-dimensional profile of an urban area. These affect the DBS receiver's ability to receive a signal from the DBS satellite and can certainly have a significant impact on the interference environment. For example, a new building constructed adjacent to a DBS receiver site could block that receiver's line-of-sight path to its satellite and force the receiver to be relocated to improve its reception. This new location may cause the receiver to be subject to interference from which it was previously shielded. Similarly, if a building is demolished or modified in a significant way, a DBS receiver could begin experiencing interference that didn't exist previously because the building shielded the MVDDS 5G transmitters and protected the DBS receiver antenna. These examples demonstrate that an EPFD analysis based on a snapshot in time cannot be used to definitively confirm that a DBS receiver will be protected from harmful interference. Importantly, the Commission's existing sharing regime was designed to facilitate efficient use of spectrum while ensuring the continued growth of DBS services. To achieve this growth, DBS networks must have sufficient flexibility to add new receivers and to accommodate changes in topography, all of which is ignored by the Coalition's technical studies. Furthermore, the Technical Studies appear to have cherry-picked the areas of study. For example, one deployment scenario involved a section of

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[1] *See* Tom Peters, "MVDDS 12.2-12.7 GHz Co-Primary Service Coexistence" (June 8, 2016), attached to MVDDS 5G Coalition Petition Comments ("Technical Study I"); Tom Peters, MVDDS 12.2-12.7 GHz Co-Primary Service Coexistence II (June 23, 2016), attached to MVDDS 5G Coalition Petition Reply Comments ("Technical Study II").

[2] Technical Study I at 12; Technical Study II at 6.

downtown Washington, D.C. near Capital One Arena.[3] While there are residences in this area, it would not be considered heavily residential compared to other areas of the city where there are likely many more DBS receivers and, therefore, much more challenging conditions.

Second, the example included in Figure 3 of the Coalition's first Technical Study estimates obstructed areas for only one orbital location (110W). This estimate overstates areas where DBS service is obstructed due to lack of line of site with the satellites delivering the service. In the real world, MVDDS licensees would need to consider all orbital locations of satellites supporting DBS services to estimate obstructed areas. Obstructed areas based on all DBS satellites will be smaller (and in some areas much smaller) than the shadow area for just one satellite. Thus, the potential for MVDDS to cause harmful interference to DBS actually occurs over a much larger area than the Coalition purports to show in Figure 3 of its first Technical Study.

B. The Technical Studies Rely on LIDAR Data That May Lead to Inaccurate Assumptions.

The Coalition's technical studies rely on the United States Geological Service's Light Detection and Ranging (LIDAR) data to determine locations of clutter (*i.e.*, buildings and vegetation) in areas of interest.[4] Although use of high-resolution clutter data is an important piece of accurate EPFD analyses in urban/suburban areas, it has limitations when relied on exclusively. As already noted, the number and location of buildings vary over time due to construction, which makes it necessary to continually acquire (*i.e.,* purchase) updated LIDAR data to ensure that interference assessments remain accurate. Furthermore, LIDAR data does not provide any information about the type of clutter and its associated RF transmission characteristics. Different clutter and building materials (*e.g.,* wood, concrete, steel, glass, foliage) can result in significantly different amounts of signal attenuation along the interference path between an MVDDS interferer and DBS receiver. For example, LIDAR data would not be able to account for the significantly greater interference potential of an MVDDS transmitter located near an RF-transparent window (and facing a DBS receiver) as opposed to an MVDDS transmitter located in an interior hallway.

AT&T is also not aware of any evidence that the use of LIDAR data to model propagation effects at 12 GHz has been validated by field measurement to ensure it can be accurately used to model interference into DBS receivers. No such validation of the LIDAR model and propagation tool provided by Cellular Expert Company was presented.

C. The Coalition Used Artificially Low EIRP Levels in its Modeling.

The EIRP levels used in the Coalition's deployment scenarios are too low. These studies assumed 5G MVDDS transmitter maximum EIRP levels ranging from 36 to 48 dBm per 100 MHz for different indoor and outdoor applications.[5] Similar 5G applications at lower bands

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[3] Capital One Arena was formerly known as the Verizon Center. Technical Study II at 4.

[4] Technical Study I at 7; Technical Study II at 5.

[5] Technical Study I at 9, 19; Technical Study II at 18.

employ higher EIRP values, often exceeding 60 to 70 dBm per 100 MHz. Because lower frequencies suffer from fewer propagation losses than 12 GHz frequencies, to obtain similar results 12 GHz 5G MVDDS transmitters would be required to operate at even higher EIRP values. A realistic EPFD coexistence study of 5G services at 12 GHz should assume higher EIRP levels to provide a more accurate compatibility analysis.

D. The Study Relies on Highly Selective Examples of Real-World Deployment.

The Coalition's technical studies rely too narrowly on only three 5G MVDDS deployment scenarios to claim compatibility with DBS: point-to-point fixed links, mobile applications in "urban canyons," and indoor small cells.[6] However, planned and existing 5G use cases indicate a much wider range of likely deployment configurations and applications that the Coalition failed to consider, such as:

- *Geography*: 5G services could be deployed universally in rural, suburban and urban environments.

- *Installation Heights*: 5G base stations could be placed both below and above surrounding clutter, not just at the Coalition's assumed height of approximately 4 meters above ground level.

- *Ubiquity of Customer Equipment:* Ubiquitous, blanket-licensed customer equipment, both mobile and fixed, could transmit in proximity to DBS receivers, potentially causing interference.

- *Power Levels:* 5G services could transmit at maximum allowable power levels which, as noted above, could be significantly higher than those assumed in the Coalition's simulation.

- *Service Applications*: 5G service applications could range from mobile to fixed wireless broadband to massive Internet of Things (IoT) deployments. Other emerging 5G applications include fixed wireless broadband access and self-backhaul, in which broadband services are provided by a 5G base transmitter located at a height that would allow clear line-of-sight to surrounding home rooftops and DBS receivers. Lastly, 5G is expected to provide machine-to-machine communications for robots, sensors, healthcare, smart meters, cameras, cars, drones, and other future uses. In some of these cases (such as drones), deployments would not necessarily be restricted to just terrestrial applications but could also be airborne and within line-of-sight of any DBS receiver.

A serious coexistence analysis would need to examine these and other realistic assumptions of 5G use cases. However, the Coalition's simulations conveniently chose to ignore them.

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[6] Technical Study I at 7; Technical Study II at 25.

II. THE COALITION'S THREE DEPLOYMENT SCENARIOS RELY ON FAULTY ASSUMPTIONS

The Coalition's technical studies, and its assessment of potential for 5G MVDDS interference to DBS, are wholly inadequate. These studies offer stylized analyses of coexistence for three very specific 5G deployment scenarios. The underlying assumptions of the 5G user cases described in these studies are either incorrect or improbable and would require exhaustive and possibly ongoing coordination between the 5G terrestrial MVDDS and the DBS service operators.

A. Scenario 1: Point-to-Point Fixed Links

In the rural point-to-point, two-way link 5G scenario, the Coalition's technical studies only consider 5G antenna heights of 30 and 50 meters above ground level ("AGL").[7] The potential for lower heights (with higher interference risk to DBS installation) exists and was not considered. Furthermore, the study assumes that both ends of the point-to-point link were at the same height AGL, even though there would be many scenarios in which one end of the link is at a different height AGL.[8] This change in height from one end of a link to another would have a substantial impact on the ensuing EPFD analysis.

The study also assumes relatively short point-to-point links of about 5 miles in length, which affords reduced transmit powers in the range of only 30 dBm per 24 MHz.[9] The study notes that higher transmit powers of up to 55 dBm per 24 MHz could support links of up to 16 miles, but no EPFD analysis was performed for this much higher transmit power scenario.[10] Typical point-to-point fixed links in the 11 GHz band range from 5 to 20 miles while transmitting at EIRP levels of 67-75 dBm for 10, 30 and 40 MHz channels. 5G MVDDS operators could be expected to use similar link distances and EIRP values in the 12 GHz band; however, the Coalition's technical studies omit this use case.

B. Scenario 2: Urban Canyon Small Cells/ Mobile Use

In the case of mobile applications in "urban canyons," the Coalition wrongly assumes that 5G signals don't propagate well in urban environments and, as discussed above, that DBS terminal installations will be severely limited due to line-of-sight requirements to the DBS satellite.[11] This technical study fails to consider that there are always some urban areas with unobstructed paths and less signal attenuation and that changes in topology can significantly alter the areas in which line-of-sight will be clear or limited. Similarly, the technical studies should have, but did not, account for DBS terminals that may be installed on sides of buildings or balconies.

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7 Technical Study I at 15.

8 *Id.*

9 *Id.* at 16.

10 *Id.* at 18.

11 Technical Study I at 19; Technical Study II at 10.

Critically, the technical studies' mobile use analysis also fails to assess the impact of actual mobile operation. Instead, the analysis was limited to a snapshot in time with stationary mobile devices. No consideration was afforded to key factors such as how to conduct an EPFD analysis for mobile interferers that could be anywhere at any time. For example, a mobile user could be located in close proximity to a DBS receiver (such as on a balcony where the customer has a DBS dish installed, or a drone flying by a rooftop where DBS antennas are located) potentially causing significant harmful interference to the DBS antenna. And, the Coalition acknowledges that the modeled "worst case environment" for mobile emitters produces greater interference than from 5G base stations, but notably refrains from concluding whether coexistence is possible.[12] Nor did either Technical Study consider the potential for multipath effects that could lead to interference being received at a DBS receiver even if it was not within the line-of-sight of terrestrial mobile operations.

Further, the Coalition's technical study fails to consider the complexity of detecting and demonstrating interference to DBS from mobile 5G transmitters. By their very nature, interference from mobile transmitters would be transient and could potentially have ceased by the time the DBS customer reported quality of services concerns to the DBS provider and tests could be conducted. Neither the DBS customer nor their service provider would be able to confirm that interference was in fact caused by the 5G mobile transmitter. Because confirmation of interference – and mitigation by the interferer – would be unobtainable, the effect is that the DBS subscriber and their service provider would essentially lose the benefit of co-primary rights.

Current MVDDS license rules were carefully designed after exhaustive engineering studies to accommodate fixed, unidirectional, and lower power MVDDS transmissions while protecting existing DBS customers and enabling future DBS growth. In adopting these rules, the Commission recognized that relying solely on EPFD exceedance zone simulations would nonetheless result in potential harm to DBS receivers.[13] It is for this reason that the current rules provide DBS customers of record with interference protection rights for up to one year after a potentially-interfering MVDDS transmitter commences operations. As such, current rules afford protection rights to customers of record for a year after MVDDS transmissions commence. No analogous protection mechanism exists to address scenarios where the MVDDS transmitter is mobile. As noted above, the DBS service provider would simply not be able to detect nor demonstrate interference likely under the various use cases described here and many others.

C. Scenario 3: Indoor Small Cells

The third scenario considered in the technical studies was deployment of 5G MVDDS indoor small cells.[14] As was the case in the other two interference scenarios, a very specific example was used to assume small cell coexistence with DBS. In the real world, indoor small cell and DBS coexistence is almost certainly much more complex. Internal and external building materials could have a significant impact on the signal level in many cases due to each material

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[12] Technical Study I at 24.

[13] *Amendment of Parts 2 and 25 of the Commission's Rules to Permit Operation of NGSO FSS Systems Co-Frequency with GSO and Terrestrial Systems in the Ku-Band Frequency Range,* Memorandum Opinion and Order and Second Report and Order, 17 FCC Rcd 9614, ¶ 89 (2002).

[14] Technical Study I at 25; Technical Study II at 16.

having different properties and hence imposing differing penetration losses on the signal. These differences were not accounted for in the simulations. The study also suggests the possibility of mobile devices using geofencing to limit mobile user emissions near glass windows or doorways.[15] However, from a practical deployment standpoint, it seems unlikely that 5G operators will have incentives to employ such restrictions on their mobile base stations out of concern for generating interference to nearby DBS receivers located outside the building in which the 5G MVDDS transmitter operates.

III. THE COALITION'S CLAIMS REGARDING NON-INTERFERENCE TO DBS CANNOT BE SQUARED WITH ITS ARGUMENTS REGARDING NGSO OPERATIONS

The Coalition's claim that 5G MVDDS will not interfere with DBS cannot be reconciled with its claim that 5G MVDDS is incompatible with NGSO FSS operations in the same band. The 5G MVDDS Coalition concludes that "coexistence between MVDDS 5G operations and DBS receivers is possible with modest adjustments to MVDDS site locations and radiofrequency design parameters."[16] Yet in their interference analysis with respect to NGSO FSS earth stations in the 12.2-12.7 GHz band, the Coalition concludes that "coexistence between MVDDS 5G operations and NGSO FSS operations is not possible without severe operational constraints on MVDDS, NGSO FSS or both services."[17]

To support its claim of incompatibility with NGSO FSS, the Coalition provides an interference budget analysis summarized in Table 3 of its original technical study.[18] That table compares the received signal from an NGSO satellite at its corresponding FSS earth station, with the range of signal levels from a nearby MVDDS emitter. The calculations in the table show that, for an MVDDS emitter to produce an equivalent signal power level as that of the earth station's received satellite signal, the MVDDS emitter would need to be separated by nearly 32 kilometers. Because this is such an extensive separation distance, the study concludes that coexistence is not feasible.

In Attachment B hereto, AT&T reproduced Table 3 from the study (Column A), but with an additional column (Column B) that compares the interference analysis with a victim DBS receiver. Column B contains typical DBS link parameters filed with the FCC. The table shows that, when applying the same assumptions that the Coalition's study uses to demonstrate incompatibility with NGSO FSS and DBS, the interference impact is even worse for DBS. Whereas the Coalition's study indicates that a separation distance of nearly 32 kilometers is needed to protect NGSO FSS earth stations, over 52 kilometers would be needed to protect DBS receivers. While recognizing that NGSO earth stations have antennas with continually changing orientation to track satellites in the constellation, thus creating some instances in which the earth station boresight could be aligned with the MVDDS transmitter, the same type of main-beam

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15 Technical Study I at 26-27.

16 *Id.* at 35.

17 *Id.*

18 *Id.* at 34.

interference scenarios could be possible with any number of MVDDS 5G applications as described in previous sections above.

AT&T does not dispute the Coalition's interference analysis between MVDDS 5G transmissions and NGSO earth stations. Rather, AT&T notes that this analysis cannot be squared with the Coalition's assertion that the Commission can permit two-way, terrestrial mobile 5G operations in the 12.2-12.7 GHz band without causing harmful interference to DBS.

Appendix B

Comparison of MVDDS Interference to NGSO FSS and DBS

	Column A: MVDDS to NGSO FSS	Column B: MVDDS to DBS	
Satellite EIRP Density	-13.4	12.2	dBW/4kHz
Satellite EIRP Density	40.6	66.2	dBm/MHz
Channel Bandwidth	250.0	24.0	MHz
Total Power	64.6	80.0	dBm
Satellite Altitude	1200.0	36500.0	km
Free Space Path Loss	175.9	205.8	dB
Receive (Rx) Power Maximum	-135.4	-139.6	dBm/MHz
Max MVDDS Power	23.0	23.0	dBm/24 MHz
Max MVDDS Power Density	9.2	9.2	dBm/MHz
Path Loss for Equal Power	144.6	148.8	dB
Free Space Path Loss Distance	31996.7	52278.5	meters
Minimum MVDDS Power	-40.0	-40.0	dBm/24 MHz
Minimum MVDDS Power Density	-53.8	-53.8	dBm/MHz
Path Loss for Equal Power	81.6	85.8	dB
Free Space Path Loss Distance	22.7	37.0	meters