

commenters object to FiberTower's proposals to restrict feeder link earth stations to distances greater than 100 miles from a 24 GHz license area and to limit the number to no more than five. EchoStar and DIRECTV argue that such severe constraints are inequitable given the co-primary status of both services in the band and state further that these restrictions would place undue burden on 17/24 GHz operators.<sup>381</sup> DIRECTV argues further that such draconian rules are unnecessary and that it is possible to establish interference protection criteria between 24 GHz FS and 17/24 GHz BSS systems.<sup>382</sup>

121. We agree that FiberTower's proposed restrictions on BSS earth stations are too severe. This approach would obviate the coordination process traditionally employed in other frequency sharing situations, by placing the entire burden of interference mitigation onto the BSS earth station operator. Such a requirement is not consistent with the Commission's approach to frequency sharing among co-primary services wherein we have typically sought to distribute any coordination burden in an equitable manner among all affected parties. Nor is it consistent with our approach to efficient use of spectrum resources. Rather, the Commission has historically relied upon coordination among affected parties to resolve interference issues, only resorting to less spectrum-efficient methods such as geographic separation in cases where coordination was not considered feasible (e.g., ubiquitously-deployed, small-diameter earth stations.) In addition, we note that many of the technical parameters that FiberTower claims are required to fully understand the frequency sharing situation are best made available as part of the coordination process itself. Accordingly, we continue to believe that coordination is a viable approach to resolving inter-service interference issues in this band, and note that this is also the approach 24 GHz FS licensees use to resolve interference issues among themselves.<sup>383</sup> As all commenters agree, FS facilities are not operating in large parts of the country.<sup>384</sup> These regions will be the likely locations for the majority of BSS feeder link earth stations so that the issue of coordination should be raised relatively infrequently. Moreover, given the relatively small number of anticipated feeder link earth stations in combination with their large-diameter antennas, we do not believe that the coordination burden on either party will be overly severe.

#### b. Coordination Threshold

122. SES Americom states that Commission rules are sufficient to effect coordination and to protect 24 GHz FS operations, and consequently urges the Commission to adopt no new requirements.<sup>385</sup> However, EchoStar and DIRECTV both propose an additional requirement to facilitate sharing in the case of 24 GHz FS and 17/24 GHz BSS earth station operations.<sup>386</sup> They note that the Commission's rules already establish interference protection criteria between adjacent terrestrial license areas in the 24 GHz band.<sup>387</sup> Specifically, Section 101.509(e) includes a recommendation that coordination is not necessary if the pfd at the boundary of the adjacent terrestrial licensing area is less than -114 dBW/m<sup>2</sup>/MHz, and that licensees should be able to deploy with a pfd of up to -94 dBW/m<sup>2</sup>/MHz at the boundary of the relevant adjacent area without negatively affecting the operations of the adjacent area licensee.<sup>388</sup> EchoStar and DIRECTV urge the Commission to adopt this same approach for 24 GHz FS and 17/24 GHz BSS

<sup>381</sup> EchoStar Reply Comments at 11, DIRECTV Reply Comments at 24.

<sup>382</sup> DIRECTV Reply Comments at 24.

<sup>383</sup> See 47 C.F.R. § 101.509.

<sup>384</sup> See FiberTower Comments at 9, EchoStar Reply Comments at Technical Annex at 15, SES Americom Reply Comments at 19, and DIRECTV Reply Comments at 23.

<sup>385</sup> SES Americom Reply Comments at 18.

<sup>386</sup> DIRECTV Comments at 30, DIRECTV Reply Comments at 24, and EchoStar Reply Comments at 16.

<sup>387</sup> *Id.*

<sup>388</sup> See 47 C.F.R. § 101.509(e).

systems. They assert that it has worked well among 24 GHz terrestrial service licensees for many years and argue that it will work equally well in the present case.<sup>389</sup> In conjunction with this proposal, commenters submit analyses to demonstrate that with worst-case assumptions, separation distances required to meet this coordination threshold are typically on the order of 50 miles.<sup>390</sup>

123. In its reply comments FiberTower submits a technical analysis to demonstrate the need for a minimum separation of 100 miles from the edge of a 24 GHz FS licensing area.<sup>391</sup> FiberTower states that the results of its preliminary study indicate that pfd level specified in Section 101.509(e) of our rules is insufficient and should be reduced from -114 dBW/m<sup>2</sup>/MHz to at least -142 dBW/m<sup>2</sup>/MHz to protect FS operations.<sup>392</sup> Consequently, FiberTower asserts that substantial changes are needed in the Commission's rule.<sup>393</sup> Although FiberTower continues to urge the Commission to adopt a 100-mile exclusion zone at the edges of the FS license areas, it proposes as an alternative that the pfd criterion specified in Section 101.509(e) should be changed to -142 dBW/m<sup>2</sup>/MHz, and outlines an accompanying approach for determining compliance with this-pfd limit.<sup>394</sup>

124. We adopt a pfd level as a coordination threshold at the edge of the FS license area. Under such a scheme, the operator of a 17/24 GHz BSS feeder link earth station that produces a pfd level greater than the specified threshold value at the boundary of a 24 GHz FS license area would be required to coordinate its operations with the affected FS operations. Such an approach is relatively straightforward, and distributes the burden of coordination equitably among all parties. In addition, it is consistent with the approach currently contained in our rules to permit licensing of co-frequency 24 GHz FS operations in adjacent Economic Areas (EA's). In contrast to requiring an absolute separation distance, this approach will allow operators to take into account the various interference-mitigating factors that will vary at different locations around the country including foliage or terrain-shielding, as well as regional differences in precipitation. Moreover, such an approach will permit operators the flexibility to implement various mitigation techniques and to mutually resolve their coordination problems with as little input from the Commission as possible.

125. DIRECTV and EchoStar assert that the current pfd level in Section 101.509(e) can be successfully extended to the case of BSS feeder link earth station transmissions to serve as a threshold for FS/BSS coordination.<sup>395</sup> FiberTower, however, argues that this pfd level should be reduced by 28 dB to afford sufficient protection to 24 GHz FS operations.<sup>396</sup> The pfd coordination threshold of Section 101.509(e) was adopted in the *24 GHz Report and Order* to facilitate coordination between U.S. licensed 24 GHz FS operations.<sup>397</sup> The Commission adopted a -114 dBW/m<sup>2</sup>/MHz value to be consistent with the

<sup>389</sup> See DIRECTV Comments at 30, DIRECTV Reply Comments at 24, and EchoStar Reply Comments at 16.

<sup>390</sup> See EchoStar Reply Comments at 14, DIRECTV Reply Comments at 25. As commenters correctly note, the calculated coordination distance is a function of the earth station antenna elevation angle, which in turn varies depending upon its geographic location as well as the orbital position of the satellite. It also will depend upon the uplink power levels of the earth station as well as its off-axis performance characteristics.

<sup>391</sup> See FiberTower Reply Comments at Attachment 1.

<sup>392</sup> See FiberTower Reply Comments at 6 and Attachment 1. FiberTower's analysis assumes an FS receiving antenna with 45 dBi gain, and a 4 dB noise figure. The criteria used for acceptable interference power levels at the FS receiver input is the value that will raise the receiver noise threshold by 1 dB.

<sup>393</sup> *Id.*

<sup>394</sup> *Id.* at 10.

<sup>395</sup> See EchoStar Reply Comments at Technical Annex at 12, DIRECTV Reply Comments at 14.

<sup>396</sup> See FiberTower Reply Comments at 9.

<sup>397</sup> See *24 GHz Report & Order*, 15 FCC Rcd at 16963, paras. 65-68.

coordination threshold value in the U.S. and Canada agreement for coordination between administrations in the border areas.<sup>398</sup> Consequently, FiberTower's proposal would create more extensive difficulties in the general ability of 24 GHz FS licensees to coordinate with each other, and possibly with co-frequency operations across the border with Canada as well. Thus, changing the pfd threshold of Section 101.509(e) has ramifications far beyond the question of FS/BSS coordination and raises issues well outside the scope of this rulemaking. Accordingly, we decline to reduce the pfd coordination threshold of Section 101.509(e) in this rulemaking. Nor do we believe that there is justification for adopting a pfd coordination threshold for 17/24 GHz BSS operations different from the one applied to the transmissions of other co-frequency operations. For these reasons, we extend the pfd coordination threshold value of  $-114 \text{ dBW/m}^2/\text{MHz}$  value now specified in our rules for coordination of fixed service operations, to BSS feeder link earth stations seeking to operate in the 24 GHz band. Further, to fully protect 24 GHz FS operations from multiple feeder link earth stations, any pfd level used as a coordination threshold at the FS license boundary must be cumulative. Accordingly, when determining whether the pfd threshold limit is exceeded at the 24 GHz FS licensing boundary, a feeder link earth station applicant must take into account not only the transmissions from its own antenna(s), but also those from any previously authorized feeder link earth stations. Thus, if the cumulative pfd level at the FS license boundary is in excess of  $-114 \text{ dBW/m}^2/\text{MHz}$ , the earth station applicant must either modify its proposed operations such that this value is not exceeded, or enter into coordination with the affected FS licensee.

126. Commenters raise the question of methodology used to compute the pfd level at the boundary of the FS license area. EchoStar states that the pfd calculation should be based on the actual characteristics of the proposed earth station, use a realistic propagation model such as ITU-R Recommendation P.452, with a reasonable probability of occurrence (e.g., 1%), and take into account the topography around the earth station.<sup>399</sup> FiberTower asserts that the pfd should be determined at the boundary of the 24 GHz FS license area by establishing the EIRP of the earth station toward the horizon on the azimuth toward the FS boundary, and then applying the spreading loss for the distance between the feeder link station and the FS boundary.<sup>400</sup> If transmit power control is used, the EIRP value used in the calculation should be the maximum value.<sup>401</sup> We agree with FiberTower that in cases where adaptive uplink power control is used the EIRP value used for calculation should be the maximum.<sup>402</sup> We also agree with EchoStar that calculations should be based on the actual characteristics of the proposed earth station. Consistent with our other pfd requirements,<sup>403</sup> we also take into account only free-space propagation loss when computing the pfd level at the FS license area. Although we recognize that many factors including terrain, atmospheric attenuation and climactic variations will likely further decrease pfd levels, we believe that a coordination threshold should be as simple and straightforward a calculation as possible. Other interference-mitigating factors may be taken into account should the coordination process be invoked.

127. We are establishing a procedure whereby 17/24 GHz BSS feeder link earth stations may be licensed, subject to coordination with 24 GHz FS licensees when warranted. This procedure presumes

<sup>398</sup> *Id.* See Interim Arrangement Concerning the Sharing between Canada and the United States of America on Broadband Wireless Systems in the Frequency Bands 24.25-24.45 GHz, 25.05-25.25 GHz, and 38.6-40.0 GHz, signed by the FCC on Dec. 8, 1999 and Canada on Dec. 21, 1999.

<sup>399</sup> See EchoStar Reply Comments at Technical Annex at 17.

<sup>400</sup> See FiberTower Reply Comments at 10.

<sup>401</sup> *Id.*

<sup>402</sup> In Section III.E.1 of this Order we modify Section 25.204(g) to provide for the use of uplink adaptive power control. We also limit the use of power control to an excess of no more than 20 dB.

<sup>403</sup> See, e.g., § 25.208.

that the earth station's location is outside of the 24 GHz FS license area. We need not address the case where 17/24 GHz BSS earth stations and 24 GHz FS systems might operate in the same EA since we do not intend to license 17/24 GHz BSS feeder links to operate in an existing 24 GHz FS license area. Such a sharing situation is considerably more complicated, and in this instance, we agree that more information and study is necessary to develop appropriate sharing criteria.<sup>404</sup> Moreover, we recognize that at some point in the future, additional 24 GHz FS licenses may be awarded, and that these operators may wish to consider locating their operations within an EA where a feeder link earth station has previously been licensed. Commenters have raised the possibility that BSS and FS working groups should complete the necessary technical studies and develop sharing criteria.<sup>405</sup> The Commission supports all such efforts by the industry. It is possible that after further study and the development of more detailed sharing criteria, we may reconsider these requirements.

128. As noted above, we anticipate that additional 24 GHz FS systems may be authorized subsequent to future Commission action. Such systems locating near an authorized 17/24 GHz BSS feeder link earth station may not claim protection from interference from the feeder link earth station's transmissions, provided that these transmissions are compliant with our rules. Rather, future 24 GHz FS applicants will be required to take into account the transmissions from the previously authorized earth station when considering system designs, including the choice of location for its license area. To make these decisions, future FS applicants must have access to relevant feeder link earth station characteristics. Accordingly, we make clear that all applicants for 17/24 GHz BSS feeder link earth stations are subject to the information filing requirements of Sections 25.203 and 25.251 of our rules, whether or not coordination is required on the basis of the pfd levels adopted above.

## 2. Sharing in the 17 GHz Band

129. **Coordination with NTIA Encouraged:** The Radiolocation Service is allocated use of the 15.7-17.3 GHz band on a primary basis, and the 17.3-17.7 GHz band on a secondary basis for U.S. Government systems.<sup>406</sup> As stated in the *NPRM*, military services are the largest users of the 15.7-17.3 GHz band and their radiolocation operations include a large number of radar systems, particularly high-powered synthetic aperture radars operating near the 17.3 GHz band edge.<sup>407</sup> The Commission, noting similar concerns of the National Telecommunications and Information Administration (NTIA), anticipated that unwanted emissions from high-power, adjacent-band radiolocation systems, could pose a significant harmful interference threat to 17/24 GHz BSS subscriber earth stations.<sup>408</sup> The Commission also recognized that discussions between the radiolocation and BSS communities could help to resolve potential adjacent band interference issues between the two services. In the *NPRM*, the Commission noted its encouragement of operator-to-operator discussions as a means of resolving interference issues, and sought comment on this approach. Specifically, the Commission asked how best to address the issue of potential adjacent-band interference into 17/24 GHz BSS receivers.<sup>409</sup>

130. The *NPRM* also made available information that NTIA had provided concerning technical and operating characteristics of certain adjacent-band radiolocation systems that it considers

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<sup>404</sup> See FiberTower Reply Comments at 5, FWCC Reply Comments at 5.

<sup>405</sup> See FiberTower Comments at 13, FWCC Reply Comments at 6.

<sup>406</sup> See 47 C.F.R. § 2.106.

<sup>407</sup> See 17/24 GHz BSS *NPRM*, 21 FCC Rcd at 7468, para. 94.

<sup>408</sup> *Id.*

<sup>409</sup> See 17/24 GHz BSS *NPRM*, 21 FCC Rcd at 7469, para. 95.

likely to impact 17/24 GHz BSS receiving earth stations.<sup>410</sup> We sought comment on the general applicability of the NTIA's findings to planned 17/24 GHz BSS systems.<sup>411</sup> The NPRM also sought comment on anticipated BSS receiver sensitivity to unwanted adjacent-band emissions, on the level of protection required, and on any measures 17/24 GHz BSS operators might adopt in order to mitigate such interference.<sup>412</sup> Specifically, it asked whether the Commission should adopt requirements to limit 17/24 GHz BSS receiver susceptibility to unwanted emissions, and specifically what requirements might be appropriate.<sup>413</sup>

131. Finally, the NPRM recognized that Federal Government systems use the Radiolocation Service secondary allocation in the 17.3-17.7 GHz band by operating numerous types of radiolocation stations.<sup>414</sup> NTIA indicates that radiolocation systems may seek to continue operating in this spectrum regardless of their allocation status with respect to the BSS, albeit at limited geographic areas and in limited portions of the band.<sup>415</sup> The NPRM sought comment on approaches by which BSS operations could co-exist with secondary radiolocation operations.<sup>416</sup>

132. Commenters agree that radar interference into 17/24 GHz BSS receivers is a serious issue that must be addressed as early as possible.<sup>417</sup> Commenters recognized the need for further exchange of information between industry and federal government concerns to better analyze the extent of the interference problem, and to develop appropriate mitigation strategies.<sup>418</sup> Accordingly, commenters encourage the Commission to facilitate this process.<sup>419</sup>

133. EchoStar states that both in-band and adjacent-band interference mechanisms will prevent 17/24 GHz BSS receivers from operating when the radiolocation signal is present.<sup>420</sup> EchoStar maintains that out-of-band interference will most severely affect those frequencies closest to 17.3 GHz, but that frequencies up to 100 MHz from the band edge are likely to be seriously impaired;<sup>421</sup> the in-band

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<sup>410</sup> See Appendix C for the technical characteristics of the radiolocation systems operating in the 15.7-17.3 GHz band. The NTIA also identified two likely interference scenarios, and made available measured data from a 4 GHz system.

<sup>411</sup> See 17/24 GHz BSS NPRM, 21 FCC Rcd at 7469, para. 96.

<sup>412</sup> See 17/24 GHz BSS NPRM, 21 FCC Rcd at 7469, paras. 95-97.

<sup>413</sup> See 17/24 GHz BSS NPRM, 21 FCC Rcd at 7470, para. 97.

<sup>414</sup> See 17/24 GHz BSS NPRM, 21 FCC Rcd at 7471, para. 99.

<sup>415</sup> See Letter to Dale M. Hatfield, Chief, Office of Engineering and Technology, Federal Communications Commission, from William T. Hatch, Associate Administrator, Office of Spectrum Management, National Telecommunications and Information Administration, (March 29, 2000). See also Letter to Edmond J. Thomas, Chief, Office of Engineering and Technology, Federal Communications Commission, from Fredrick R. Wentland, Associate Administrator, Office of Spectrum Management, National Telecommunications and Information Administration (April 8, 2005).

<sup>416</sup> See 17/24 GHz BSS NPRM, 21 FCC Rcd at 7471, para. 100.

<sup>417</sup> See EchoStar Comments at Technical Annex, A.6.2, DIRECTV Comments at 31-33, EchoStar Reply Comments at 18, and SES Americom Reply Comments at 19.

<sup>418</sup> *Id.*

<sup>419</sup> *Id.*

<sup>420</sup> EchoStar Comments at Technical Annex at 24.

<sup>421</sup> *Id.*

interference will prevent receiver function on all channels while the signal is present.<sup>422</sup>

134. DIRECTV presents a generalized, worst-case analysis as well as a detailed examination of four interference scenarios for adjacent-band interference from airborne radar systems.<sup>423</sup> The interference scenarios consider different antenna couplings between the radar and the BSS earth station: mainbeam-to-mainbeam antenna coupling, mainbeam-to-sidelobe antenna coupling, sidelobe-to-mainbeam antenna coupling, and sidelobe-to-sidelobe antenna coupling. The analysis results for mainbeam-to-mainbeam antenna coupling show significant interference from the adjacent band radars, but the estimated probability of this interference scenario occurring is  $3 \times 10^{-8}$  and the interference event only occurs for approximately 2 seconds.<sup>424</sup> For the mainbeam-to-sidelobe and sidelobe-to-mainbeam antenna coupling again interference is shown, but the estimated probability of this scenario occurring is  $2 \times 10^{-4}$  and again the duration of the interference is around 2 seconds. From the DIRECTV analysis the most likely interference scenario is sidelobe-to-sidelobe antenna coupling. In this scenario the analysis shows that interference-to-carrier ratios as high as 9.1 dB may result, but that interference is limited primarily to the first transponder. In general, the analysis results indicate that for a single radar and BSS receiver interaction that the probability of interference is low and the duration of interference is relatively short. However, if the radars are operated over long durations and large geographic areas the probability and duration of interference can increase. DIRECTV believes that in order to fully evaluate the potential impact on BSS receivers additional information is needed on the current and future radar systems in the 15.7-17.3 GHz band. We agree with DIRECTV that further exchanges of information are necessary in order to fully assess the potential impact on BSS receiver operations. We encourage the industry representatives to work directly with NTIA to obtain this information.

135. DIRECTV also states that, in the measurement results presented by NTIA, a key finding was that the maximum interference tolerance is directly related to the ratio of the interference pulse length to the information signal length. DIRECTV questions whether error correction coding or data interleaving could significantly mitigate the effects of radar interference as the symbol rates of planned 17/24 GHz BSS systems will result in signal lengths on the order of 1000 times less than those planned for the radar systems.<sup>425</sup> The DIRECTV assessment of the NTIA measurements is based on the in-band pulse characteristics (pulse width and pulse repetition frequency) of the radar systems provided by NTIA. However, the out-of-band radar signal that appears after the front-end filtering of a BSS earth station receiver may not have the same characteristics as the in-band radar signal (*e.g.*, the pulse width may be shorter). Measurements of the effects of out-of-band pulsed interference on the BSS receiver could serve to quantify this effect. For example, as part of the above-mentioned discussion and information exchange between industry and NTIA, equipment representative of the 17/24 GHz BSS earth station receivers could be provided to NTIA for testing and evaluation.<sup>426</sup>

136. Another sharing scenario was raised by NTIA in a letter dated March 21, 2007.<sup>427</sup> In that

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<sup>422</sup> *Id.*

<sup>423</sup> DIRECTV Comments, Appendix at A-1 to A-16.

<sup>424</sup> Estimates of interference duration assume an aircraft speed of 500 feet per second.

<sup>425</sup> DIRECTV Comments, Appendix at A-14.

<sup>426</sup> We recognize that 17 GHz BSS receivers may not be available at this time. However, earth station receivers operating in nearby frequency bands (*e.g.*, 18.3-18.86 GHz) may have sufficiently similar characteristics to the 17 GHz receivers.

<sup>427</sup> See Letter from John M. R. Kneuer, Assistant Secretary for Communications and Information, United States Department of Commerce to Kevin J. Martin, Chairman, Federal Communications Commission, dated March 21, 2007.

letter, NTIA, on behalf of the Department of Defense (DoD), requested that we adopt the following footnote to the U.S. Table of Frequency Allocations:

"US402 - In the band 17.3-17.7 GHz, existing Federal satellites and associated earth stations in the fixed-satellite service (Earth-to-space) are authorized to operate on a primary basis in the frequency bands and areas listed below. Receiving earth stations in the broadcasting-satellite service within the bands and areas listed below shall not claim protection from Federal earth stations in the fixed-satellite service.

(a) 17.600-17.700 GHz for stations within a 120 km radius of 38°49'N latitude and 76°52'W longitude.

(b) 17.375-17.475 GHz for stations within a 160 km radius of 39°42'N latitude and 104°45'W longitude."<sup>428</sup>

Additionally, NTIA states that Government Footnote G117 should be modified to limit Federal fixed-satellite use of these bands to military systems.

137. NTIA states that the U.S. Government's implementation of this allocation supports military functions as well as specific national security interests of the United States and further asserts that this allocation is essential for these federal space systems to perform satisfactorily.<sup>429</sup> In addition, NTIA states that non-federal operations in this band are currently limited to existing transmitting feeder links for the BSS and future receiving BSS earth stations. According to NTIA, the federal operations are limited to two sites and only utilize a portion of the 17.3-17.7 GHz band and have operated compatibly with the BSS feeder links for many years. We agree with NTIA that protecting these Federal operations at this time will ensure that BSS operators have sufficient time to design their future space-to-Earth systems accordingly.<sup>430</sup>

138. Based on the foregoing, we find that this change to the U.S. Table of Frequency Allocations is related to the exercise of military functions of the United States in support of urgent national security interests. Consequently, we also find that notice and public comment procedures are, for good cause shown, impracticable, unnecessary, and contrary to the public interest. Accordingly, the Commission is authorized to waive the public notice provisions of the Administrative Procedure Act (APA) pursuant to 47 C.F.R. Sections 1.412(b)(1) and 1.412(c).<sup>431</sup> Based on the representations of NTIA that adoption of a national footnote and an amendment of a government footnote specifically supports essential military functions of the national defense, we find that the public interest will best be served by accommodating NTIA's request to expeditiously add United States Footnote US402 to the U.S. Table of Frequency Allocations and amend Government Footnote G117 of the U.S. Table of Frequency Allocations.

139. Finally, with regard to the secondary in-band interference issue, DIRECTV notes the lack of sufficient technical information necessary to perform an analysis of the problem, but suggests that given more information exchange between industry and the Federal Government it may be possible to adopt case-by-case solutions to accommodate such operations.<sup>432</sup> We agree with DIRECTV that further

<sup>428</sup> *Id.*

<sup>429</sup> *Id.*

<sup>430</sup> *Id.*

<sup>431</sup> See also 47 U.S.C. § 154(j); 5 U.S.C. § 552(b)(1); 47 C.F.R. § 0.603(a); 47 C.F.R. § 1.3; *Bendix Aviation Corp. v. FCC*, 272 F. 2d 533, 536-537 (D.C. Cir. 1959), *cert. denied sub nom. Aeronautical Radio, Inc. v. United States*, 361 U.S. 965 (1960).

<sup>432</sup> *Id.* at A-15.

exchanges of information are necessary in order to develop solutions to this issue. We encourage the parties to talk with NTIA directly to develop solutions to this issue.

## H. Pending Applications

140. *Pending Applications Treated as Filed Simultaneously; Amendments Required to Conform to Rules Adopted Herein; Freeze Imposed on New Applications:* As noted, we adopted a first-come, first-served licensing procedure for GSO-like applications and a modified processing round approach for NGSO-like applications in the *First Space Station Licensing Reform Order*. In doing so, we recognized that retroactively applying these procedures to all applications pending at that time may not best serve the public interest. Thus, we stated that we would apply the procedures "in cases where doing so will help further the goals of this proceeding to expedite service to the public and discourage speculation."<sup>433</sup> We decided to treat most pending GSO-applications under the first-come, first-served procedure. In other words, in most cases, we would grant a pending application if the applicant was qualified and if the proposed system would not cause harmful interference to any previously licensed satellite or to any satellite proposed in a previously filed application. The Commission adopted a somewhat different procedure for V-band applications, which had been filed pursuant to a processing round cut-off.<sup>434</sup> There, the Commission treated all pending GSO V-band applications as though they were filed at the same time and entitled to concurrent consideration. This meant that if two or more V-band applications were mutually exclusive, the Commission would divide the available spectrum equally among the qualified licensees. The Commission employed a third processing approach for pending Ka-band NGSO applications. There, the Commission had already issued a *Notice of Proposed Rulemaking* in which it proposed a technical solution that would resolve mutual exclusivity and allow NGSO systems to share the same spectrum.<sup>435</sup> Consequently, we determined that we did not need to use the band-splitting approach we adopted for mutually-exclusive NGSO applications in the *First Space Station Reform Order*.<sup>436</sup> Instead, we granted each qualified NGSO Ka-band applicant authority to operate throughout the available spectrum.<sup>437</sup>

141. DIRECTV, EchoStar, and Intelsat make various suggestions as to how to process the pending 17/24 GHz space station applications.<sup>438</sup> DIRECTV generally proposes that we should process the applications under the first-come, first-served approach.<sup>439</sup> Nevertheless, they request that we exempt

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<sup>433</sup> *First Space Station Licensing Reform Order*, 18 FCC Rcd at 10863, para. 276.

<sup>434</sup> *First Space Station Licensing Reform Order*, 18 FCC Rcd at 10863-6, paras. 275-284.

<sup>435</sup> See Establishment of Policies and Service Rules for the Non-Geostationary Satellite Orbit, Fixed-Satellite Service in the Ka-band, *Notice of Proposed Rulemaking*, 17 FCC Rcd 2807 (2002) ("*Ka-band NGSO NPRM*").

<sup>436</sup> *First Space Station Licensing Reform Order*, 18 FCC Rcd at 10865, para 280. Establishment of Policies and Service Rules for the Non-Geostationary Satellite Orbit, Fixed Satellite Service in the Ka-band, *Report and Order*, 18 FCC Rcd 14708 (2003) ("*Ka-band NGSO Report and Order*").

<sup>437</sup> *Id.*

<sup>438</sup> The other comments did not address the treatment of pending applications.

<sup>439</sup> DIRECTV Comments at 17, DIRECTV Reply Comments at 7, n. 14. Although EchoStar favors an auctions or processing round approach for processing applications, EchoStar alternatively suggests that if the Commission adopts a first-come, first-served approach, the pending application should be processed using date priority. EchoStar Reply Comments at 20. Under a date-priority approach, assuming no locations are changed, DIRECTV and EchoStar would each receive five authorizations assuming they do not request a change of orbital location, Intelsat would receive two authorizations, and the Pegasus applications would be denied. EchoStar Reply Comments at 20.

them from the rule<sup>440</sup> that requires us to treat their amended applications as newly filed. Newly filed applications move to the bottom of the processing queue. In contrast, Intelsat recommends that we allow each applicant to amend a single application at a time, in order of the entity's date of filing its first application, "round-robin" style. This means that the entity with the oldest filing would be given the opportunity to file an amended application, with its choice of orbital location, first. The next entity to pick would be the remaining entity with the oldest application, and so on. Once all applicants had amended one application, each would be given an opportunity, in turn, to amend a second, third, fourth, and fifth application as warranted.<sup>441</sup> Intelsat suggests that a "round-robin" procedure will ensure that orbital locations are assigned in a manner that promotes competition.<sup>442</sup> For the reasons discussed below, we adopt another approach that treats all pending applications as filed simultaneously

142. There are 22 pending applications for 17/24 GHz BSS space station authorizations.<sup>443</sup> Most of these filings are not at a four-degree-compliant location or request an orbit location less than 4 degrees away from a location sought by another entity. As a result, under any processing method used for the pending applications, we will not be able to grant all the applications as originally filed. We further recognize that applicants will be required to amend their pending applications to conform to the new service and technical rules, including the rule limiting applicants to five pending 17/24 GHz BSS applications.<sup>444</sup> At the same time, we will require applicants to select a location conforming to the four-degree spacing framework adopted today.<sup>445</sup> Moreover, some applicants may choose not to continue prosecuting their pending applications due to changed business plans. Consequently, we expect the amended applications to look materially different than the pending applications.

143. In light of these anticipated material changes and the new rules for the 17/24 GHz BSS, we will treat the applications before us, as amended, as though they were filed at the same time.<sup>446</sup> Accordingly, as in the V-band proceeding, where two or more applications are mutually exclusive, we will divide the available spectrum equally among the applicants pursuant to Section 25.158(d). To the extent necessary, we will waive Sections 25.116 and 25.155(c) of our Rules to process the applications in this manner.<sup>447</sup> We find that this approach best serves the public interest by most equitably balancing our

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<sup>440</sup> 47 C.F.R. § 25.116 (b); (d). Specifically, Section 25.116 explains that major amendments that change orbital locations, frequencies bands, increase the potential for interference, or are otherwise deemed substantial pursuant to Section 309 of the Communications Act will cause the application to lose its status relative to later-filed applications in the "queue" as described in 25.158.

<sup>441</sup> Intelsat Comments at 6, Intelsat Reply Comments at 7.

<sup>442</sup> Intelsat Comments at 6.

<sup>443</sup> See Appendix E listing the 22 pending applications.

<sup>444</sup> See para. 15 above.

<sup>445</sup> See paras. 66-74 above.

<sup>446</sup> If, however, an applicant makes a major amendment to its application after the amendment deadline, we will treat the amended application as newly filed pursuant to Section 25.116(d). Thus, the opportunity to amend an application and have it treated as simultaneously filed with the other pending applications does not extend past the date specified by the Bureau.

<sup>447</sup> The Commission may waive a rule for good cause shown. Waiver is appropriate if special circumstances warrant a deviation from the general rule and such deviation would better serve the public interest than would strict adherence to the general rule. *Northeast Cellular Telephone Co. v. FCC*, 897 F.2d 1166 (D.C. Cir. 1990). Generally, the Commission may grant a waiver of its rules in a particular case if the relief requested would not undermine the policy objective of the rule in question and would otherwise serve the public interest. *WAIT Radio v.*

(continued....)

goals of maximizing use of scarce spectrum and orbital resources while at the same time retaining opportunities for competitive entry and speeding service to the public.

144. We recognize that where the spectrum will be divided, the authorizations issued under this procedure may not be exactly what the applicants expected. This, by itself, would not bar the adoption of this procedure.<sup>448</sup> As we explained in the *First Space Station Reform Order*, the Commission has the authority to apply new procedures to pending applications if doing so does not impair the rights an applicant possessed when it filed its application, increase an applicant's liability for past conduct, or impose new duties on applicants with respect to "transactions already completed."<sup>449</sup> Applicants do not gain any vested right merely by filing an application.<sup>450</sup> Merely filing an application cannot be considered a "transaction already completed" for purposes of this analysis. It would be within our authority to dismiss all the pending applications entirely and start the licensing process anew.<sup>451</sup> Such an action, however, would not serve the policy goals articulated above. Thus, we conclude that there is no legal barrier to our processing the pending applications as filed simultaneously.

145. To implement our decision here, we direct the Bureau to release a Public Notice shortly after these rules become effective, inviting applicants to amend the applications pending as of the date of this order consistent with the rules we adopt today. Applicants can amend their choice of orbital locations consistent with our spacing rules adopted today to reduce the likelihood of mutual exclusivity. In addition, applicants are limited to five pending 17/24 GHz BSS applications.<sup>452</sup> Any application that is not amended by the date specified by the Bureau will be dismissed as defective.<sup>453</sup> The Bureau will

(...continued from previous page)

FCC, 418 F.2d 1153, (D.C. Cir. 1969); *Dominion Video Satellite, Inc., Order and Authorization*, 14 FCC Rcd 8182 (Int'l Bur. 1999).

<sup>448</sup> See *First Space Station Licensing Reform Order*, 18 FCC Rcd at 10865, para. 278 and n.673 (citing *Landgraf*, 511 U.S. at 269-70; *DIRECTV*, 110 F.3d at 826, citing *Bell Atlantic Telephone Cos. v. FCC*, 79 F.3d 1195, 1207 (D.C. Cir., 1996); *Black Citizens for a Fair Media v. FCC*, 719 F.2d 407, 411 (D.C. Cir., 1983).

<sup>449</sup> *DIRECTV, Inc. v. FCC*, 110 F.3d 816, 825-26 (D.C. Cir., 1997) (*DIRECTV*); *Landgraf v. USI Film Products*, 511 U.S. 244, 280 (1994) (*Landgraf*). In *DIRECTV*, the appeals court found that the Commission's decision to adopt an auction rule was not retroactive and hence unlawful. In doing so, the appeals court relied on the Supreme Court's finding in *Landgraf* that "there are three ways in which a rule can be retroactive: if it "impair[s] rights a party possessed when he acted, increase[s] a party's liability for past conduct, or impose[s] new duties with respect to transactions already completed."

<sup>450</sup> *Chadmoore Communications, Inc. v. FCC*, 113 F.3d 235, 240-41 (D.C. Cir. 1997) (*Chadmoore*). ("In this case the Commission's action did not increase [the applicant's] liability for past conduct or impose new duties with respect to completed transactions. Nor could it have impaired a right possessed by [the applicant] because none vested on the filing of its application."); *Hispanic Info. & Telecomms. Network v. FCC*, 865 F.2d 1289, 1294-95 (D.C. Cir. 1989) ("The filing of an application creates no vested right to a hearing; if the substantive standards change so that the applicant is no longer qualified, the application may be dismissed."); *Schraier v. Hickel*, 419 F.2d 663, 667 (D.C. Cir. 1969) (filing of application that has not been accepted does not create a legal interest that restricts discretion vested in agency). See also *United States v. Storer Broadcasting Co.*, 351 U.S. 192 (1952) (pending application for new station dismissed due to rule change limiting the number of licenses that could be held by one owner); *Bachow Communications, Inc. v. FCC*, 237 F.3d 683, 686-88 (D.C. Cir. 2001) (*Bachow*) (upholding freeze on new applications and dismissal of pending applications in light of adoption of new licensing scheme); *PLMRS Narrowband Corp. v. FCC*, 182 F.3d 995, 1000-01 (D.C. Cir. 1999) (applicant did not, by virtue of filing application, obtain the right to have it considered under the rules then applicable).

<sup>451</sup> *Bachow Communications, Inc. v. FCC*, 237 F.3d 683, 686-88 (D.C. Cir. 2001)

<sup>452</sup> See 47 C.F.R. § 25.159.

<sup>453</sup> 47 C.F.R. § 25.112(a)(2).

review the amended applications to determine whether they are substantially complete and acceptable for filing. The Bureau will place acceptable applications on public notice. The Bureau will return to the applicant as defective any amended applications that are not substantially complete.<sup>454</sup> In the event that two or more amended applications are mutually exclusive, we direct the Bureau to consider the applications together and, if the applicants are qualified, to license them to operate in an equal portion of the spectrum.<sup>455</sup>

146. To facilitate the amendment process, we require each applicant to notify the Commission by letter, within 45 days of release of this Order, whether it intends to go forward with each of its pending applications. If an applicant fails to file a notification of its intent to proceed with a particular application, we will dismiss that application. By identifying applications that will not be pursued in advance of the amendment deadline, the remaining applicants may be in a better position to reach a compromise regarding their orbital assignment requests and minimize, or avoid, mutually exclusive situations.

147. Finally, from the release date of this Order until a date and time designated by the Bureau after the pending applications are amended, we establish a freeze on new applications. The freeze on 17/24 GHz BSS applications applies to any application for authority to provide service to the United States using the 17.3-17.7 GHz (space-to-Earth) and 24.75-25.25 GHz (Earth-to-space) frequency bands or to provide international satellite service using the 17.7-17.8 GHz (space-to-Earth) frequency band. This freeze is limited to applications for licenses for new space stations or for new requests for market access by foreign-licensed space stations. Further, the freeze does not apply to amendments to the 22 pending applications.

#### IV. FURTHER NOTICE OF PROPOSED RULEMAKING

148. In the *NPRM*, the Commission sought comment on what measures were needed to address issues concerning reverse band operations. These included measures to mitigate against space-path interference between DBS and 17/24 GHz BSS satellites (space-path interference) and to protect 17/24 GHz BSS subscribers from DBS feeder links (ground-path interference). The record on these issues is insufficient to develop requirements. While most commenters advocate certain general approaches, we need more information to build on the generalities and derive specific requirements. Thus, we seek further comment on the issues concerning reverse band operations.

##### A. Ground-Path Interference in Reverse Band Operations

###### 1. Background

149. As discussed in the *NPRM*,<sup>456</sup> ground path interference will occur when the signals from transmitting DBS<sup>457</sup> feeder link earth stations operating in the 17.3-17.7 GHz band are detected at the receiving earth stations of 17/24 GHz BSS subscribers. This interference situation will be the most severe

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<sup>454</sup> See *First Space Station Licensing Reform Order*, 18 FCC Rcd at 10852, para. 244. Applications of PanAmSat Licensee Corp. For Authority to Construct, Launch, and Operate a Hybrid Satellite System in its Separate International Communications Satellite System, *Order on Reconsideration*, 18 FCC Rcd 23916 (2003). We note that the Commission reserves the right to return an application which has been placed on Public Notice as acceptable for filing if, upon further examination, it is determined that the application is not in conformance with the Commission's rules. See, e.g., Policy Branch Information, Satellite Space Applications Accepted for Filing, *Public Notice*, Report No. SAT-00418 (Feb. 2, 2007).

<sup>455</sup> In these cases, licensees will be allowed to select the particular band segment they wish to use no earlier than 60 days before they plan to launch the satellite. 47 C.F.R. § 25.158(d)(5).

<sup>456</sup> See *17/24 GHz BSS NPRM*, 21 FCC Rcd at 7453-54, para. 57.

<sup>457</sup> In this section, the terms "DBS" or "DBS earth station" refer to earth stations that are DBS feeder links.

in areas surrounding the DBS feeder uplink stations. In addition, 17/24 GHz BSS operators who choose to co-locate their TT&C earth stations with DBS TT&C earth stations systems may experience difficulty in receiving the downlinked telemetry signal from the 17/24 GHz BSS spacecraft. Although at present there are a relatively small number of DBS feeder link and TT&C earth stations, the *NPRM* recognized that DBS feeder link earth stations that transmit in the Earth-to-space direction may increasingly locate in populated areas, thereby escalating the potential for interference into 17/24 GHz BSS subscriber antennas.<sup>458</sup> The *NPRM* also anticipated that future entrants, such as short-spaced DBS systems, or non-U.S. DBS satellites serving the U.S. market, could result in the deployment of an even greater number of feeder link earth stations at multiple sites within the United States.<sup>459</sup> The *NPRM* also raised concerns that the interference problem could be further exacerbated by the proliferation of small-diameter 17/24 GHz BSS subscriber receiving antennas with relatively poor off-axis discrimination properties.<sup>460</sup>

## 2. Grandfathering Existing DBS Uplink Facilities

150. *Tentatively Conclude that Existing DBS Feeder Link Earth Stations Should Not be Subject to New Interference-Mitigation Requirements:* DIRECTV notes that, although DBS operators have recently sought authority for additional feeder link earth stations to uplink local broadcast signals from regional collection sites, the number of such sites is still very small.<sup>461</sup> DIRECTV states, by way of illustration, that it operates DBS feeder links from only four sites across the country, and has no plans for additional regional sites. DIRECTV proposes that we “grandfather” licensed and operating DBS uplink facilities so that they may continue to operate in the manner in which they were designed in reliance on the rules then in effect.<sup>462</sup> Accordingly, DIRECTV does not support off-axis EIRP density or other transmitting power limits for existing DBS feeder link antennas, or a requirement that such be shielded.<sup>463</sup> EchoStar also advocates “grandfathering” of existing DBS feeder link earth stations, arguing that there are relatively few in number, and that the majority are located in less populated areas do that they pose little problem.<sup>464</sup>

151. The Commission did not discuss this issue in the *NPRM*. Nevertheless, based on the record, we tentatively conclude that existing DBS feeder link earth stations should not be subject to new interference-mitigation requirements imposed as a result of this rulemaking. Accordingly, we intend to define an area around existing DBS feeder link earth stations that transmit in the 17.3 - 17.7 GHz band,<sup>465</sup> within which 17/24 GHz BSS receiving earth stations cannot claim protection from the DBS feeder uplink transmissions. We discuss this issue in more detail below.

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<sup>458</sup> See *17/24 GHz BSS NPRM*, 21 FCC Rcd at 7454, para. 58. This was attributed in part to the increase in local programming uplinked from metropolitan areas. See also, e.g., DIRECTV Enterprises, LLC for Authority to Launch and Operate DIRECTV 7S (USABSS-18), *Order and Authorization*, 19 FCC Rcd 7754 (2004). DIRECTV sought authority to operate uplink earth stations at sites in Los Angeles, CA, Castle Rock, CO, Winchester, VA and St. Paul, MN.

<sup>459</sup> *17/24 GHz BSS NPRM*, 21 FCC Rcd at 7454, para. 58.

<sup>460</sup> *Id.*

<sup>461</sup> DIRECTV Comments at 21.

<sup>462</sup> *Id.*

<sup>463</sup> *Id.*

<sup>464</sup> EchoStar Comments at Technical Annex at 21.

<sup>465</sup> For a listing of currently authorized earth stations operating in the 17.3-17.7 GHz band, see Appendix G.

### 3. Protection Zones for Existing DBS Uplink Facilities

152. *Comment Invited on Two Protection Zone Options:* We propose to limit any protection zone to some area surrounding the specific geographic location and frequencies within the 17.3 – 17.7 GHz BSS band in which the DBS feeder link earth station licensee is already authorized to transmit. In addition, we agree that the feeder link operator should have some ability to upgrade facilities at existing sites, as long as the modification does not cause any increase in interference to 17/24 GHz BSS receiving antennas outside of the defined protection zone.

153. We seek comment on these tentative conclusions and on how a protection zone should be defined. One option is to define the boundary of the protection zone as a fixed distance away from the coordinates of the DBS Feeder Link Earth Station. DIRECTV presents an analysis demonstrating that, in the absence of shielding, the separation distance between a DBS feeder link earth station and a receiving 17/24 GHz subscriber antenna can become significant, *i.e.*, on the order of 22 miles.<sup>466</sup> EchoStar suggests that likely separation distances necessary to mitigate groundpath interference are on the order of 10 to 60 miles.<sup>467</sup> SES Americom states that levels of interference could be harmful if the subscriber earth station is located within 20-30 km (12.5-18.6 miles) of the DBS feeder link station.<sup>468</sup>

154. We note too that the DBS feeder link earth station's transmissions will not be equal in all directions, but will vary in part as a function of azimuth and elevation angle, and this picture may be complicated by the presence of multiple transmitting antennas at a particular site. In addition, we recognize that different areas of the country will have differing climate, rainfall and terrain conditions that will also mitigate groundpath interference. Accordingly, a second option is to employ a more detailed methodology that takes into account these site-specific characteristics, rather than imposes a uniform radius around the earth station coordinates. Parties supporting this approach should explain in detail how exactly they would adjust for climate, rainfall, or terrain conditions, or any other variables that they believe should be reflected in the protection zone.

155. Thus, we invite comment on each of the two protection zone options set forth above: (1) to set the boundary at some fixed distance from the DBS feeder link earth station; or (2) to adjust that boundary to account for climate, terrain, or other considerations. We also seek comment on any other approaches we might adopt. Commenting parties should provide specific details on any such proposal.

### 4. Upgrades To Grandfathered Facilities

156. *Comments Sought on Extension of Grandfathered Facilities:* EchoStar urges the Commission to make clear that any protection is afforded to existing DBS uplink *sites*, and not just to currently licensed earth stations to protect the operator's ability to expand their existing uplink sites.<sup>469</sup> EchoStar argues that this approach would promote efficiency by reducing the number of new geographically diverse sites.<sup>470</sup> Specifically, EchoStar proposes that "grandfathering" would apply both to existing earth stations and to new earth stations located "within a mile of the easternmost, westernmost, northernmost and southernmost coordinates of existing earth stations in each site."<sup>471</sup> We seek comment

<sup>466</sup> DIRECTV Comments at 20. For the shielded case this distance is reduced to approximately 4 miles. DIRECTV's analysis necessarily assumes characteristics for both the transmitting and receiving antenna, but these may not reflect all interference situations.

<sup>467</sup> EchoStar Reply Comments, Technical Annex at 18.

<sup>468</sup> SES Americom Comments at 19.

<sup>469</sup> EchoStar Comments at Technical Annex at 21 (emphasis in original).

<sup>470</sup> EchoStar Comments at Technical Annex at 21, EchoStar Reply Comments at Technical Annex at 18.

<sup>471</sup> EchoStar Comments at Technical Annex at 21.

on EchoStar's proposal to extend "grandfathered" status to any new earth stations located within a mile of an existing earth station site.<sup>472</sup> Parties commenting on this proposal should explain in detail the reasons for their positions. Among other things, we invite comment on whether, and to what extent, adding new DBS feeder link earth stations within a mile of an existing DBS feeder link earth station is likely to increase the probability of harmful interference to 17/24 GHz BSS receivers.

157. As an alternative approach, we could define a pfd level at the boundary of the protection zone that would take into account the cumulative effect of any modified operations of the existing earth station site. If these modified operations do not exceed this pfd level, the modification would not be subject to the new coordination requirements. We seek comment on this approach. We also seek comment on what pfd level at the boundary might be suitable.

## 5. Coordination Between DBS and 17/24 GHz BSS Operators

### a. Background

158. Commenters addressing the issue of new DBS feeder link earth stations recognize that to protect the interests of 17/24 GHz BSS consumers, these earth stations will need to be subject to some restrictions.<sup>473</sup> As detailed below, we seek comment on developing a coordination zone and a coordination methodology.

### b. Coordination Zone

159. *Comment Sought on Coordination Zones:* In the *NPRM*, the Commission observed that its rules do not contain a procedure to coordinate co-frequency, DBS feeder link earth stations with BSS subscriber terminals.<sup>474</sup> Consequently, the Commission proposed to establish "coordination zones" or, in other words, areas around DBS feeder link earth stations in which coordination would be required. The Commission proposed to define these areas based on the methodology outlined in Annex 3 of Appendix 7 of the ITU Radio Regulations.<sup>475</sup>

160. The Commission further observed that it had used Appendix 7 as the basis of other coordination rules it had adopted.<sup>476</sup> The Commission also noted, however, that Table 9b of Appendix 7, which includes data needed for determining the coordination zone for services in several frequency bands, does not include some data needed for determining the coordination zone for services in the 17.3-17.8 GHz band.<sup>477</sup> Accordingly, the Commission invited parties to recommend data for a table based on Table 9b that would allow operators to calculate coordination areas for the 17.3-17.8 GHz band in a way comparable to the method operators in other frequency bands use Table 9b to determine their coordination distances.

161. Consistent with our proposal in the *NPRM*, we tentatively conclude that use of the procedure in Table 9b to establish the coordination zone for DBS feeder link earth stations and BSS subscriber terminals is appropriate. In this *FNPRM*, we seek comment on the specific values for Table 9b

<sup>472</sup> EchoStar Comments at Technical Annex at 21.

<sup>473</sup> DIRECTV Comments at 21; EchoStar Comments at Technical Annex at 21; SES Americom Comments at 19, DIRECTV Reply Comments at 27; EchoStar Reply Comments at 13, SES Americom Reply Comments at 15.

<sup>474</sup> *17/24 GHz BSS NPRM*, 21 FCC Rcd at 7454, para. 59.

<sup>475</sup> *17/24 GHz BSS NPRM*, 21 FCC Rcd at 7454, para. 59.

<sup>476</sup> *17/24 GHz BSS NPRM*, 21 FCC Rcd at 7454, paras. 59-60, citing Section 25.203(c) of the Commission's rules, 47 C.F.R. § 25.203(c).

<sup>477</sup> *17/24 GHz BSS NPRM*, 21 FCC Rcd at 7454, para. 60.

as set forth below. We seek comment on the appropriateness of this approach. Parties proposing an alternative set of values should provide a detailed justification for those values.

Table 9b

**Parameters required for the determination of coordination distance for a transmitting earth station in bands shared bidirectionally with receiving earth stations**

Parameter(s)	Value	Description	
Orbit	GSO	Orbit in which the space service in which receiving earth station operates (GSO or NGSO)	
Modulation at receiving earth station	N	Analog or digital	
Receiving earth station interference parameters and criteria	$p_0$ (%)	0.003	Percentage of the time during which interference from all sources may exceed the threshold value
	$N$	2	Number of equivalent, equal level, equal probability entries of interference, assumed to be uncorrelated for small percentages of the time
	$p$ (%)	0.0015	Percentage of the time during which the interference from one source may exceed the permissible interference power value; since the entries of interference are not likely to occur simultaneously, $p=p_0/n$
	$N_L$ (dB)	1	Link noise contribution
	$M_s$ (dB)	5	Link performance margin
	$W$ (dB)	0	A thermal noise equivalence factor for interfering emissions in the reference bandwidth; it is positive when the interfering emissions would cause more degradation than thermal noise
Receiving earth station parameters	$G_m$ (dBi)	36	On-axis gain of the receive earth station antenna
	$G_r$	10	Horizon antenna gain for the receive earth station
	$\epsilon_{min}$	5°	Minimum elevation angle of operation in degrees
	$T_e$ (K)	300K	The thermal noise temperature of the receiving system at the terminal of the receiving antenna. See § 2.1 of Annex 7 to Appendix 7 of the ITU Radio Regulations which provides a default value for two earth stations operating in opposite directions of transmission at frequencies greater than 17/24 GHz.
Reference Bandwidth	$B$ (Hz)	$1.0 \times 10^6$	Reference bandwidth (Hz), <i>i.e.</i> , the bandwidth in the receiving station that is subject to the interference and over which the power of the interfering emission can be averaged
Permissible interference power	$P_r(p)$ (dBW) in $B$	-139.5	Permissible interference power of the interfering emission (dBW) in the reference bandwidth to be exceeded no more than $p\%$ of the time at the receiving antenna terminal of a station subject to interference, from a single source of interference, using the general formula: $P_r(p) = 10 \log(k T_e B) + N_L + 10 \log(10^{Ms/10} - 1) - W$

162. DIRECTV proposes that the Commission establish a coordination zone around any new

*DBS feeder uplink earth stations and that within this zone, a new the DBS operator would be required to coordinate its operations with 17/24 GHz BSS subscriber earth stations.*<sup>478</sup> DIRECTV asserts further that this process would be greatly facilitated if new DBS uplink facilities were required to operate with strict pfd limits on transmissions toward the horizon and/or to employ shielding.<sup>479</sup> Although DIRECTV suggests that this coordination zone could be relatively large (e.g., 10 km)<sup>480</sup> it proposes no specific methodology for how such a zone might be defined, nor does it propose pfd limits in the direction of the horizon.

163. However, EchoStar proposes that, rather than defining a coordination zone, the Commission should define an area around any new DBS feeder link earth station within which 17/24 GHz BSS earth stations would become, in effect, secondary to the DBS operation and thus would be required to accept all interference.<sup>481</sup> For this reason, EchoStar contends that the methodology of Appendix 7 is not likely to determine particularly realistic separation distances, as it is intended to calculate threshold separations to initiate coordination.<sup>482</sup> EchoStar also contends that there are several other methodologies that the Commission might consider for determining the spacing between DBS feeder link stations and 17/24 GHz BSS earth stations. Specifically, EchoStar suggests that ITU-R Recommendation P.452 defines a general propagation model that could be applied, and ITU-R Recommendation S.1712, although intended for the 14 GHz band, might provide additional useful methodologies that could be extrapolated to the 17 GHz band.<sup>483</sup> In addition, EchoStar proposes that the choice of methodology for computing the separation distance should be left to the operators concerned.<sup>484</sup>

164. Accordingly, we seek comment on the above proposals, and which, if any we should adopt to facilitate reverse-band operations in the 17 GHz band. As an initial matter, we request interested parties to discuss whether the Commission should adopt a coordination zone of any type, or whether the defined zone should be an area in which the 17/24 GHz BSS is secondary to DBS as EchoStar recommends. We invite interested parties to discuss whether they prefer to define such a zone using a methodology based on Appendix 7, Annex 3 as proposed in the *NPRM*, or based on one of the ITU recommendations suggested by EchoStar (i.e., ITU-R Recommendation P.452 or S.1712). We request comment on all these proposals, and invite commenters to propose different coordination or separation distances, provided that they can provide adequate justification on the record for their proposals.

165. In addition, we seek comment on whether we should permit operators to determine jointly among themselves the choice of methodology to calculate the corresponding separation distance as EchoStar suggests. We also seek comment on how, under this approach, established 17/24 GHz BSS subscriber antennas might be protected from interference from newer DBS feeder link operations seeking to locate nearby. Such parties should explain in detail why they support their preferred methodology, and

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<sup>478</sup> DIRECTV Comments at 21.

<sup>479</sup> DIRECTV Comments at 21.

<sup>480</sup> DIRECTV Comments at 22.

<sup>481</sup> EchoStar Comments at Technical Annex at 21-22.

<sup>482</sup> EchoStar Reply Comments at Technical Annex at 17-18. Since Appendix 7 was intended for calculating thresholds to initiate coordination, it may not be particularly realistic as a basis for separation distances used in the BSS.

<sup>483</sup> *Id.*

<sup>484</sup> EchoStar Comments at Technical Annex at 21-22; EchoStar Reply Comments at Technical Annex at 18. EchoStar makes this proposal in conjunction with a proposal to limit new DBS feeder link earth stations to low-population areas. We address this proposal in more detail below.

why they believe their methodology is superior to other options. Finally, we invite parties to recommend the appropriate parameter values necessary to employ the method they support.

**c. Coordination Methodology**

166. *Comment Sought on Coordination Methodology:* We invite comment here on the methodology to be used within that zone to coordinate DBS feeder links and 17/24 GHz BSS earth stations, should the Commission adopt a coordination zone as discussed above. The *NPRM* envisioned that both DBS operators and 17/24 GHz BSS operators will be deploying new earth stations over time, so that new stations of one service will continually be established among existing stations from the other.<sup>485</sup> The Commission made a similar observation in the *MVDDS Second R&O*,<sup>486</sup> in which it addressed a frequency sharing situation that presented ground path interference issues and gradual build-out of interspersed earth stations similar to those we envision in the 17.3-17.7 GHz band.<sup>487</sup>

167. In the *MVDDS Second R&O*, the Commission concluded that careful MVDDS system design and the use of various mitigation techniques could achieve successful sharing of the 12 GHz frequency band by both services.<sup>488</sup> To accomplish this goal, the Commission adopted, among other things, a coordination procedure that requires that a MVDDS operator entering a market where DBS receivers are already established must satisfy certain requirements in order to protect these customers.<sup>489</sup> In addition, a mechanism is established for information exchange between the operators of both services, in particular to take into account recently acquired DBS customers.<sup>490</sup> The *NPRM* sought comment on whether we should adopt a similar approach to sharing between DBS feeder link earth stations and 17/24 GHz BSS receiving earth stations.<sup>491</sup> We seek further comment here. Specifically we ask whether we should adopt service rules similar to those in Section 25.203(c), requiring all applications for new (non-grandfathered) DBS feeder link earth stations or new 17 GHz transmitting TT&C stations to complete

<sup>485</sup> See *17/24 GHz BSS NPRM*, 21 FCC Rcd at 7457, para. 63.

<sup>486</sup> 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; Amendment of the Commission's Rules to Authorize Subsidiary Terrestrial Use of the 12.2-12.7 GHz Band by Direct Broadcast Satellite Licensees and Their Affiliates; and Applications of Broadwave USA, PDC Broadband Corporation, and Satellite Receivers, Ltd. to Provide a Fixed Service in the 12.2-12.7 GHz Band. *Memorandum Opinion and Order and Second Report and Order*, 17 FCC Rcd 9614 (2002) ("*MVDDS Second R&O*"), cited in *NPRM*, 21 FCC Rcd at 7457 (para. 63).

<sup>487</sup> See *17/24 GHz BSS NPRM*, 21 FCC Rcd at 7457, para. 63. In the 12 GHz band, two co-primary, co-frequency services sought to operate in a sharing scenario where ubiquitous and ongoing deployment of earth stations from both services was anticipated; the incumbent DBS receive-only antennas were subject to interference from the introduction of transmitting MVDDS stations.

<sup>488</sup> *MVDDS Second R&O*, 17 FCC Rcd at 9653, para. 88.

<sup>489</sup> See 47 C.F.R. §101.144(d).

<sup>490</sup> See *MVDDS Second R&O*, 17 FCC Rcd at 9653, para. 88. MVDDS operators are required to provide DBS operators with specific technical information concerning its planned operation. After receipt of the MVDDS system information the DBS licensees must provide the MVDDS licensee with a list of any new DBS customer locations that have been installed following the MVDDS notification. At this time, DBS licensees may also provide the MVDDS operator with additional information regarding affected customer locations, or comment on its analysis, including its agreement. Before beginning operations, the MVDDS operator must take into account existing as well as the new DBS customers of record, and ensure that its operations do not cause interference. Once the time period prescribed for this information exchange has passed, any new DBS receive antennas must be installed in a manner to avoid interference from the MVDDS signal. These later installed DBS earth stations have no right of complaint against the notified MVDDS transmitting antenna.

<sup>491</sup> *17/24 GHz BSS NPRM*, 21 FCC Rcd at 7457-58, para. 64.

prior frequency coordination with existing and planned 17/24 GHz BSS receiving stations.

168. The Commission recognizes that requiring 17/24 GHz BSS operators to make available a list of their subscriber earth stations raises issues of sensitive customer information, particularly if the DBS feeder link applicant is also a competitor. Accordingly, we tentatively conclude that use of a neutral, third-party frequency coordinator is appropriate to assuage such concerns. Thus, we propose that, prior to filing an application with the Commission, a DBS operator planning a new feeder link earth station or 17 GHz transmitting TT&C station must provide certain specified technical information to a qualified frequency coordinator. The frequency coordinator would make this technical information available to all licensed 17/24 GHz operators. Interested parties could obtain both a list of potentially-affected and active 17/24 GHz BSS customer locations that are within a defined coordination area, as well as a list of potentially-affected 17/24 GHz TT&C earth stations for which applications are on file with the Commission within the defined coordination area. The 17/24 GHz BSS operators would be required to provide these lists within 30 days upon receipt of the new DBS feeder link earth station technical information and the notice. A DBS operator would be allowed to file an application with the Commission for a new DBS feeder link or TT&C transmitting earth station within 6 months of successfully completing coordination with all stations on these lists. If the Commission grants a license for the newly proposed 17 GHz transmitting station, any 17/24 GHz receiving earth station not on these lists would be unable to claim protection from this new DBS feeder link earth station. We seek comment on this proposal, and on the method that should be employed to calculate such a coordination area.

169. We also seek comment on the types of technical information DBS feeder link earth station operators should make available for the purposes of earth station coordination with 17/24 GHz BSS operators. In the case of satellite and terrestrial earth station coordination, Commission rules now require that all transmitting satellite earth station applicants submit an interference analysis as required by Section 25.203 of the Commission's rules.<sup>492</sup> Section 25.203(c)(2) requires that the earth station applicant provide each terrestrial station licensee with specific technical details. Similarly, we propose that DBS feeder link earth station applicants provide the following information to the qualified frequency coordinator:<sup>493</sup>

- (i) The geographical coordinates of the proposed earth station antenna(s);
- (ii) Proposed operating frequency band(s) and emission(s);
- (iii) Antenna diameter (meters)
- (iv) Antenna center height above ground and ground elevation above mean sea level;
- (v) Antenna gain pattern(s) in the plane of the main beam;
- (vi) Longitude range of geostationary satellite orbit (GSO) satellites at which an antenna may be pointed, for proposed earth station antenna(s) accessing GSO satellites;
- (vii) Horizon elevation plot;
- (viii) Antenna horizon gain plot(s) determined in accordance with the procedure in Section 2.1 of Annex 5 to Appendix 7 of the ITU Radio Regulations;

<sup>492</sup> See 47 C.F.R. § 25.203(b)(2) (requiring earth station applicants to provide each terrestrial station licensee with certain specific technical details).

<sup>493</sup> This list of parameters differs slightly from the one currently specified in § 25.203(c)(2). We have deleted the parameter "Maximum permissible RF interference power level as determined in accordance with Annex 7 to Appendix 7 for all applicable percentages of time." This parameter applies in mutual interference protection situations, and is not applicable to the case of the DBS feeder link earth station that will not seek protection from receive-only 17/24 GHz BSS earth stations.

- (ix) Minimum elevation angle;
- (x) Maximum equivalent isotropically radiated power (EIRP) density in the main beam in any 1 MHz<sup>494</sup> band;
- (xi) Maximum available RF transmit power density in any 1 MHz<sup>495</sup> band at the input terminals of the antenna(s);
- (xii) A plot of the coordination distance contour(s) and rain scatter coordination distance contour(s) as determined by Table 2 of Section 3 to Appendix 7.

We ask what reference bandwidths would be appropriate in items (x) and (xi). In addition, we seek comment on whether the parameters listed here or other technical information would be appropriate to provide in order to facilitate coordination between new DBS feeder link earth stations and receiving 17/24 GHz BSS antennas.

## 6. Other Measures to Protect 17/24 GHz BSS Operations

### a. Background

170. *Comment Sought on Other Measures, Including Power Level Limits, Geographic Restriction of Earth Stations, Showing Requirements for Co-Location and Earth Station Shielding:* In addition to the protection zone and coordination requirements proposed above, some commenters assert that further measures are necessary to protect 17/24 GHz BSS earth stations from harmful interference from DBS feeder link earth stations. Those measures include: (1) limits on DBS feeder link earth station EIRP toward the horizon; (2) placement of new DBS feeder link facilities in low-population density areas; (3) technical showing requirements for co-located DBS and 17/24 GHz BSS earth stations; and (4) antenna shielding requirements.<sup>496</sup> These proposed approaches are not necessarily mutually exclusive, and it is entirely possible that we might employ several methods in combination with each other, as well as adopting the protection zone and coordination requirements discussed above. Moreover, as DIRECTV correctly notes, a decision to employ one approach may influence the extent to which we simultaneously apply another.<sup>497</sup> However, no commenter has been specific in its proposals, nor provided a comprehensive approach necessary to definitively address the issue. Consequently, we do not believe that the record is sufficiently developed so that we may determine whether to adopt requirements at this time.

171. Accordingly, we invite further comment on each of the additional measures suggested by commenters. In particular, commenters supporting any of these proposals should explain in detail why that additional measure would be necessary to protect 17/24 GHz BSS earth stations from harmful interference, in the event that we adopt coordination procedures of the kind discussed above. Moreover, such commenters should discuss whether they support adoption of all the additional measures discussed here, or whether some of the additional measures would provide adequate protection from harmful interference.

<sup>494</sup> We note that Section 25.203 stipulates a reference bandwidth of 4 kHz for frequency bands below 15 GHz and 1 MHz for frequency bands above 15 GHz.

<sup>495</sup> Section 25.203 stipulates reference bandwidths of both 1 MHz and 4 kHz.

<sup>496</sup> SES Americom Comments at 19, EchoStar Comments, Technical Annex at 22, DIRECTV Comments at 21-22, SES Americom Reply Comments at 15, EchoStar Reply Comments at 13, DIRECTV Reply Comments at 27-28.

<sup>497</sup> DIRECTV Reply Comments at 28. Specifically DIRECTV notes that, if we rely on EIRP limits to determine a separation distance, as EchoStar suggests, that the EIRP limit must be relatively strict in order to ensure that the zone of affected subscribers is reasonably small. By contrast, EIRP limits used to determine a coordination zone could be more relaxed.

**b. Power Level Limits**

172. In the NPRM, the Commission noted that Section 25.204(b) of the Commission's rules places limits on earth station EIRP in bands above 15 GHz shared coequally with terrestrial radiocommunication services, in order to facilitate sharing with these services.<sup>498</sup> The Commission sought comment on whether the Commission should extend this requirement to new DBS feeder link earth stations operating in the entire 17.3-17.7 GHz band.<sup>499</sup> The Commission also asked whether the EIRP density limits in Sections 25.204(b) through (e) would be sufficient to protect 17/24 GHz BSS earth stations, or if DBS feeder link earth stations should meet some more stringent requirements.<sup>500</sup> We seek further comment on these questions.

173. Under EchoStar's power limit proposal, new DBS earth stations would be constrained only in terms of EIRP density toward the horizon.<sup>501</sup> We invite comment on whether any such limit would be necessary if we adopt a coordination procedure as discussed above. Alternatively, we ask whether the adoption of EIRP density limits toward the horizon would obviate the need for coordination procedures. Advocates of EIRP density limits should include a specific limit in their discussions, and advocates of both approaches should provide adequate justification for their recommendations.

**c. Restrictions on Placement of New DBS Earth Stations**

174. DIRECTV and EchoStar advocate requiring DBS feeder link earth station operators to locate their earth stations only in areas of low population density.<sup>502</sup> Although neither define precisely how such sparsely populated locations would be determined, DIRECTV notes that counties with populations less than ten people per square mile comprise a significant portion of the contiguous United States.<sup>503</sup> We seek comment on this approach, either alone, or in conjunction with other proposals, and ask how the Commission should determine what constitutes a low-population density site. We also request parties to explain how DBS feeder link operators would be able to protect 17/24 GHz BSS consumer earth stations that are already deployed in these areas.

175. EchoStar makes its proposal to restrict new DBS feeder link earth stations to low population-density areas in conjunction with its proposal to require those earth stations to meet strict off-

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<sup>498</sup> See 17/24 GHz BSS NPRM, 21 FCC Rcd at 7458-59, para. 66. See also 47 C.F.R. § 25.204(b), which states that "in bands shared coequally with terrestrial radio-communication services, the equivalent isotropically radiated power transmitted in any direction towards the horizon by an earth station operating in frequency bands above 15 GHz shall not exceed the following limits except as provided for in paragraph (c) of this section:

$$+64 \text{ dBW in any 1 MHz band for } \theta < 0^\circ$$

$$+64 + 3\theta \text{ dBW in any 1 MHz band for } 0^\circ < \theta < 5^\circ$$

where  $\theta$  is as defined in paragraph (a) of this section."

<sup>499</sup> 17/24 GHz BSS NPRM, 21 FCC Rcd at 7458-59, para. 66. The NPRM also recognized that this rule was not intended to facilitate sharing among DBS and BSS earth stations, and it is applicable to DBS feeder link earth stations only in the band segment 17.7-17.8 GHz that is shared with terrestrial services.

<sup>500</sup> 17/24 GHz BSS NPRM, 21 FCC Rcd at 7458-59, para. 66.

<sup>501</sup> EchoStar Comments at Technical Annex at 22; EchoStar Reply at Technical Annex at 17. EchoStar makes this proposal in conjunction with a proposal to restrict new DBS feeder link earth stations to low-population areas. We discuss that proposal in more detail below.

<sup>502</sup> EchoStar Comments at Technical Annex at 22, EchoStar Reply at Technical Annex at 17.

<sup>503</sup> DIRECTV Reply Comments at 28.

axis EIRP density limits towards the horizon.<sup>504</sup> Presumably however, even areas of low population density may contain 17/24 GHz BSS subscribers. Thus, although this approach might be applied to new DBS feeder uplink stations locating in areas yet unoccupied by 17/24 GHz BSS subscriber earth stations, *EchoStar does not make clear how subscriber terminals would be protected if the DBS applicant sought to locate in an area where 17/24 GHz BSS consumer earth stations were already deployed.* We request commenters to address this issue.

**d. Technical Showing Requirement for Co-Located Earth Stations**

176. The *NPRM* also addressed groundpath interference that may occur between transmitting DBS feeder uplinks and the receiving telemetry stations of 17/24 GHz BSS systems that choose to locate their TT&C facilities at or near to existing DBS feeder uplink sites.<sup>505</sup> The Commission recognized that choice of facility site is a system design parameter that is under the control of the operator, and does not necessarily require a Commission action to remedy. Moreover, given the large financial investment required to launch and operate a satellite, we believe that 17/24 GHz BSS operators have strong incentive to make correct technical decisions with regard to their choice of TT&C facility sites and equipment design. However, the *NPRM* also recognized that interference into TT&C systems can present a serious problem due to the potential for loss of satellite control, and sought comment on whether the Commission should adopt requirements to guard against such scenarios.<sup>506</sup>

177. Specifically, the Commission proposed to require earth station applicants planning to co-locate their 17/24 GHz BSS TT&C stations with DBS feeder link earth stations to make a technical showing to the Commission demonstrating their ability to maintain sufficient margin in their telemetry links in the presence of the interfering DBS signal.<sup>507</sup> Similarly, the Commission proposed to require DBS feeder link earth station applicants planning to co-locate with their 17/24 GHz BSS telemetry earth stations to make an analogous technical showing to the Commission.<sup>508</sup> The Commission sought comment on these proposals and asked what parameters would be appropriate in such a showing.<sup>509</sup> It also asked whether it should preclude co-location of 17 GHz BSS TT&C and DBS feeder link facilities altogether, or whether it should require some minimum separation between such facilities.<sup>510</sup>

178. DIRECTV responds that, with careful planning, it should be possible to coordinate the operations of these two services, even to the point where the facilities can be co-located.<sup>511</sup> Accordingly, DIRECTV does not believe that the Commission should limit operator flexibility by precluding such co-location or by requiring some minimum separation distance. Rather, DIRECTV supports the Commission's proposal that operators seeking to co-locate such facilities should be required to make a technical showing demonstrating their ability to maintain sufficient margin in the 17/24 GHz BSS telemetry links in the presence of the interfering DBS signal. DIRECTV asserts that this will enable those operators who want to capture the efficiencies of co-location to do so, provided they can prove to

<sup>504</sup> EchoStar Comments at Technical Annex at 21-22.

<sup>505</sup> 17/24 GHz BSS *NPRM*, 21 FCC Rcd at 7459, para. 67.

<sup>506</sup> *Id.*

<sup>507</sup> *Id.*

<sup>508</sup> *Id.*

<sup>509</sup> *Id.*

<sup>510</sup> *Id.*

<sup>511</sup> See DIRECTV Comments at 22.

the Commission that receipt of critical 17/24 GHz BSS telemetry data will not be subject to disruption.<sup>512</sup> EchoStar also believes that such interference can be avoided by careful frequency planning of the 17 GHz uplink and downlink signals, and believes that this frequency planning can be conducted by the operator alone, within its own earth station complex.<sup>513</sup> Accordingly, we will restate the proposal to require a technical showing to the Commission in the event of co-location of DBS feeder link and 17/24 GHz BSS telemetry earth stations, and seek any further comment on the issue.

**e. Shielding**

179. We also seek comment on whether we should impose any additional requirements on either DBS feeder link earth station operators or on 17/24 GHz BSS operators in order to mitigate interference into 17/24 GHz BSS subscriber receiving antennas. We ask whether, as most commenters suggest,<sup>514</sup> a requirement to employ shielding should be adopted in conjunction with any of the approaches discussed above, and if so what form such a requirement might take.

**B. Space Path Interference in Reverse Band Operations**

180. *Comment Sought on Protection Method for DBS Satellite and Associated BSS Information Required to Effect Protection:* The *NPRM* sought comment on how best to manage the problem of space path interference arising when the transmitted signals from 17/24 GHz BSS satellites are received by the feeder link receivers on satellites operating in the DBS service.<sup>515</sup> In addition, the *NPRM* sought comment on the particular instance where applicants sought to locate within the same cluster as co-frequency receiving DBS satellites and asked whether this was feasible at all, and if so what measures might be required to facilitate such co-clustering.<sup>516</sup> The Commission also sought comment on the more general question of locating 17/24 GHz BSS satellites at close distances to co-frequency DBS satellites and asked what measures, including a minimum orbital separation requirement, off-axis EIRP limits, antenna discrimination requirements, or other requirements might be adopted to protect DBS receiving antennas from unacceptable interference.<sup>517</sup> Finally the *NPRM* sought comment on the particular problem of interference to DBS TT&C transmissions in the 17 GHz band that could result in loss of satellite control.<sup>518</sup> The Commission proposed to require 17/24 GHz BSS space station applicants seeking to co-locate with DBS satellites to make a technical showing demonstrating their ability to sufficiently minimize interference such that adequate margin is maintained in the DBS telecommand links.<sup>519</sup> An analogous requirement was proposed for any future DBS applicant seeking to co-locate with 17/24 BSS satellites to make a similar technical showing demonstrating its ability to maintain sufficient TT&C link margin.<sup>520</sup>

181. Commenters addressing these issues all realize the potential for space path interference between 17/24 GHz BSS and DBS satellites, but generally maintain that co-location is feasible at

<sup>512</sup> See DIRECTV Comments at 22.

<sup>513</sup> See EchoStar Comments at Technical Annex at 23.

<sup>514</sup> See DIRECTV Comments at 20; EchoStar Comments, Technical Annex at 21; SES Americom Comments at 19; DIRECTV Reply at 27; EchoStar Reply at 13; SES Americom Reply at 15.

<sup>515</sup> See 17/24 GHz BSS *NPRM*, 21 FCC Rcd at 7460-63, paras. 71-79.

<sup>516</sup> See 17/24 GHz BSS *NPRM*, 21 FCC Rcd at 7462, para. 76.

<sup>517</sup> See 17/24 GHz BSS *NPRM*, 21 FCC Rcd at 7462, para. 77.

<sup>518</sup> See 17/24 GHz BSS *NPRM*, 21 FCC Rcd at 7462, para. 78.

<sup>519</sup> *Id.*

<sup>520</sup> *Id.*

relatively small orbital separations, typically on the order of a few tenths of a degree.<sup>521</sup> EchoStar asserts that a separation of 0.4 degrees is sufficient, however only if the DBS and 17/24 BSS satellites are operated by the same licensee.<sup>522</sup> EchoStar argues that the risk of interference in such situations is most severe, and is best avoided by assigning space-to-Earth frequencies at that location only to the 17/24 GHz BSS operator that uses these same frequencies in the Earth-to-space direction for its DBS feeder link operations.<sup>523</sup> DIRECTV also believes that co-frequency operation may be possible at small orbital separations, but that this will depend upon a number of factors including the gain toward the GSO of both transmitting and receiving satellites as well as the desired protection level of the DBS system.<sup>524</sup> DIRECTV also believes that given the many uncertainties involved, it is best to permit only operators who control transmissions in both directions at a given location to locate in close proximity as they can best "self coordinate" their operations.<sup>525</sup> DIRECTV also suggest that the Commission may want to consider a strict off-axis gain specification for 17/24 GHz BSS satellites wishing to locate within a certain distance of a DBS satellite.<sup>526</sup>

182. SES Americom and Intelsat oppose the idea that 17/24 GHz BSS satellites seeking to operate at the same frequency and location as DBS satellites should only be licensed to the corresponding DBS licensee, arguing that this restriction is unnecessary and unfairly favors incumbent DBS operators.<sup>527</sup> SES Americom believes that spacepath interference issues can be resolved through the use of offset orbital locations and coordination between operators.<sup>528</sup> Similarly, Intelsat believes that a four-degree orbital spacing plan with small offsets in combination with coordination between operators will be sufficient to mitigate spacepath interference issues between closely spaced 17/24 GHz BSS and DBS satellites.<sup>529</sup> In Section III. D. of this Order, we require 17/24 GHz BSS satellite licensees to design their satellites to be capable of operating in a four-degree spacing environment. We will license satellites in this band only if they comply with the orbital spacing rules we adopt in this Order.

183. EchoStar also proposes that the spacepath interference into DBS receivers can be managed by establishing a pfd value at the victim (*i.e.*, DBS) receiver above which coordination is required. Specifically, EchoStar proposes a pfd threshold level at the victim satellite receiver of -93 dBW/m<sup>2</sup>/24 MHz and derives this value from the ITU 6% ΔT/T requirement used to determine the need for coordination between Administrations, contained in Appendix 30A of the Radio Regulations.<sup>530</sup> EchoStar also proposes that the Commission should require a minimum separation between DBS and

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<sup>521</sup> DIRECTV Comments at 25, SES Americom Comments at 20, EchoStar Comments at 4, DIRECTV Reply Comments at Appendix A, and Intelsat Reply Comments at 14. *See also* Erratum to DIRECTV Reply Comments at A-1, in which a supplementary analysis is presented demonstrating that under certain conditions, separations as small as 0.05 degrees may be feasible.

<sup>522</sup> EchoStar Comments at 10-12.

<sup>523</sup> *Id.*

<sup>524</sup> DIRECTV Comments at 26.

<sup>525</sup> *Id.*

<sup>526</sup> *Id.*

<sup>527</sup> Intelsat Reply Comments at 14, SES Americom Reply Comments at 12.

<sup>528</sup> SES Americom believes that minimum separations of 0.2-0.3 degrees are required. *See* Comments of SES Americom at 20.

<sup>529</sup> Intelsat Reply Comments at 14-15.

<sup>530</sup> EchoStar Comments at 17 and Appendix A. *See also*, the ITU Radio Regulations, Annex 4 of Appendix 30A, § 7.1 of Article 7 of Appendix 30A.

17/24 GHz BSS satellites of at least 0.2-0.3 degrees, although these parameters might be relaxed in the event of agreement among all affected parties.<sup>531</sup>

184. We concur with EchoStar's proposed approach to managing spacepath interference between 17/24 GHz BSS and DBS satellites by requiring coordination when pfd values are exceeded at the DBS satellite receiver. This approach is consistent with the method used by the ITU<sup>532</sup> and has proved workable for international coordination of satellite systems. However, as EchoStar notes, its proposed pfd value depends in part on certain assumptions about the DBS off-axis receiving antenna gain<sup>533</sup> and may not afford sufficient protection to all systems, particularly as DBS off-axis antenna gain patterns are not necessarily well known.<sup>534</sup> Accordingly, in order to protect receiving DBS satellites from unacceptable levels of interference, we propose to adopt an off-axis pfd coordination trigger of -93 dBW/m<sup>2</sup>/24 MHz at the DBS receiving antenna. Coordination with affected co-frequency licensees, both existing and planned, would be required in the event that the 17/24 GHz BSS satellite exceeds this level at the DBS receiving antenna; coordination would not be required in cases where no frequency overlap occurs. We seek comment on this proposal and ask whether it is sufficient to protect existing DBS operations from interference, or whether some other approach or additional requirement might better protect DBS receiving antennas from unwanted spacepath interference. We also ask how such a requirement might apply to future DBS operations that might be affected, including in particular any replacement satellites.

185. We also seek comment on the particular information that 17/24 GHz BSS applicants should be required to submit to the Commission. Clearly, reliable information concerning the off-axis transmitting antenna gain of the 17/24 GHz BSS satellite will need to be made available. Presumably this information will need to include *all* frequencies in the 17.3 – 17.7(8) GHz range so that any future DBS applicant will also have sufficient information to protect its operations from unwanted interference. We seek comment on what form this information should take (*i.e.*, measured data, charts, graphs). We ask whether off-axis gain in the plane of the GSO is sufficient and over what angular range it should be provided (*e.g.*,  $\pm 30^\circ$ ,  $\pm 45^\circ$  with respect to the plane passing through the x- and y-axes of the satellite.)

186. In its reply comments EchoStar also proposes the Commission adopt a minimum orbital separation between 17/24 GHz BSS and DBS satellites of 0.2-0.3 degrees.<sup>535</sup> SES Americom also believes that an orbital offset of at least 0.2-0.3 degrees is necessary for co-frequency operation of DBS and 17/24 GHz BSS satellites.<sup>536</sup> DIRECTV however indicates that a minimum orbital separation value as small as 0.05 degrees would be sufficient to permit co-frequency operation, provided modest care in satellite antenna design is employed.<sup>537</sup> We seek comment on EchoStar's proposal to require a minimum orbital separation between co-frequency operation of DBS and 17/24 GHz BSS satellites, and we ask what separation value is appropriate should we adopt such a requirement. We also seek comment on whether such a requirement is necessary should we adopt the pfd threshold and coordination requirements

<sup>531</sup> EchoStar Reply Comments at 9. In its comments, EchoStar cautions that such limits may be insufficient in instances of co-location, and may also result in less efficient use of spectrum. EchoStar Comments at 11.

<sup>532</sup> See Annex 4 of Appendix 30A of the ITU Radio Regulations.

<sup>533</sup> See Appendix A, Table A of EchoStar Comments. Specifically, this value was derived assuming a victim off-axis antenna gain toward the interfering satellite of 0 dBi, and is based on the technical parameters for DBS receiving antennas given in Section 3.7.3 of Annex 3 of Appendix 30A of the ITU Radio Regulations.

<sup>534</sup> EchoStar Comments at 32, DIRECTV Comments at 23.

<sup>535</sup> EchoStar Reply Comments at 9.

<sup>536</sup> SES Americom Comments at 13.

<sup>537</sup> Erratum to DIRECTV Reply Comments at Appendix A.

discussed above, particularly if, as EchoStar suggests, this separation value might be relaxed by agreement among the affected operators.

187. Finally, the NPRM sought comment on our proposal to protect DBS TT&C operations, particularly in recognition of the potential for loss of satellite control. DIRECTV comments on this proposal, asserting that the Commission should allow co-location of 17/24 GHz BSS and DBS space stations only if the affected DBS operator gives its consent, and only if the 17/24 GHz BSS applicant demonstrates its ability to maintain sufficient margin in the DBS telecommand links in the presence of the interfering 17/24 GHz BSS signal.<sup>538</sup> We believe this proposal has merit, for both 17/24 GHz BSS operators seeking to locate in close proximity to DBS satellites, and also in the case where DBS operators may seek to locate in close proximity to established 17/24 GHz BSS satellites. Accordingly, we propose to adopt a requirement that a 17/24 GHz BSS applicant proposing to locate its satellite in the vicinity of a DBS space station make a technical showing to the Commission demonstrating its ability to sufficiently minimize interference into the DBS systems, such that adequate margin is maintained in the DBS telecommand links in the presence of the interfering BSS signal. Similarly we will require that a DBS applicant proposing to locate its satellite in the vicinity of existing 17/24 GHz BSS space station make a technical showing to the Commission demonstrating its ability to maintain sufficient margin in its telecommand links in the presence of the interfering BSS signal. We seek comment on these proposals. We ask under what circumstances such a technical showing should be required, *e.g.*, co-location at less than some minimum distance, or on the basis of a threshold pfd value. We seek comment on whether the threshold pfd level of -93 dBW/m<sup>2</sup>/MHz proposed above is also a suitable coordination trigger for DBS telecommand links, or whether some other value might be more appropriate. We also seek comment the maximum orbital separation distance at which would be appropriate to require such a technical showing.

188. SES Americom also commented on 17/24 GHz BSS interference into DBS telecommand links, stating that issues relating to space path interference can be resolved through offset of orbital locations and coordination between the involved operators with respect to TT&C frequencies.<sup>539</sup> SES Americom also stated that it believes that a frequency separation of as little as 500 kHz is adequate to prevent interference from the beacon of a 17/24 GHz BSS satellite into the command carrier of a DBS space station.<sup>540</sup> We seek comment on whether some minimum frequency separation is required between the signals transmitted by a 17/24 GHz BSS space station and the telecommand frequencies of DBS space station located in close proximity to the 17/24 GHz BSS space station, or a combination of frequency separation and pfd limits, and what the appropriate parameters would be.

## V. CONCLUSION

189. With this Report and Order, we adopt licensing and service rules for the 17/24 GHz BSS that will facilitate the deployment of new broadband services. These rules include a first-come, first-served processing approach for licensing 17/24 GHz BSS applications, several safeguards (*e.g.*, bond requirements, milestones, and limit on number of applications), geographic service requirements to provide service to Alaska and Hawaii, and various public service obligations. We also adopt a Further Notice of Proposed Rulemaking to seek comment on technical issues related to reverse band operations to address potential interference concerns.

<sup>538</sup> DIRECTV Comments at 23.

<sup>539</sup> SES Americom Comments at 20.

<sup>540</sup> SES Americom Comments at 20.