

iii. Interim Frequency Assignments	86-87
b. Financial Qualifications/Milestone Requirements	88-93
3. Rules Applicable to a Licensing Approach Based on Auction Procedures . .	94-111
4. Pioneer's Preference Requests	112-114
5. Miscellaneous Issues	115-121
III. CONCLUSION	122
IV. PROCEDURAL MATTERS	123-125
V. ORDERING CLAUSES	126-127
APPENDIX I: Proposed Rules and Regulations to be Added to 47 C.F.R. Part 25 of the Commission's Rules	
APPENDIX II: Initial Regulatory Flexibility Analysis	

I. INTRODUCTION

1. Earlier this year we allocated the 2310-2360 MHz band for satellite-delivered digital audio radio service (DARS).¹ With this Notice of Proposed Rulemaking, we initiate consideration of service and licensing rules to govern this service. Specifically, we request comment on issues that include how many licenses should be awarded; how much spectrum each licensee should be assigned; how licensees should be selected if mutually exclusive applications are filed; whether applications already pending before the Commission should receive special consideration; how those licensees should be classified; whether licensees should be permitted to use some of their spectrum for non-DARS services; and what rules should govern the operation of DARS transmissions to ensure service to the public and to prevent interference to competitors and other services.

2. Satellite DARS will both compete with and complement traditional terrestrial AM and FM radio service. It has the capability to serve geographic areas that terrestrial radio does not reach. Because of terrain features and other factors, such as small population, certain areas of the United States receive few or no terrestrial radio broadcasts. Individuals living in or traveling through these areas would be given expanded options by DARS due to its mobile capabilities and nationwide service area. Even in areas with substantial radio service, satellite DARS also could expand and complement the audio programming choices now available to listeners. By offering a nationally based service, satellite DARS providers could target niche audiences that have not been served by traditional local radio but now could be served as an aggregate national audience. Such specialized program offerings could include foreign language programming, music formats not usually carried by radio broadcasts, and programming geared to children or senior citizens.

3. It also is apparent that satellite DARS, to some extent, will compete with terrestrial radio. Proposed satellite DARS systems will provide 30 or more channels of national digital audio programming to fixed and mobile receivers, with the potential for each licensee to offer high quality audio channels throughout the country. By way of contrast, terrestrial broadcasters are limited to four channels in a single geographic area. Thus, satellite DARS may have an advantage in both cost and channel offerings over local broadcast stations in delivering national programming to listeners, as well as an advantage in the number of channel outlets available in each community. Some of these DARS channels may provide some programming that is similar to what is available on local stations.

¹ Amendment of the Commission's Rules with Regard to the Establishment and Regulation of New Digital Audio Radio Services, 10 FCC Rcd. 2310 (1995) (Allocation Order).

4. However, it does not necessarily follow that satellite DARS would have a significant adverse impact on terrestrial broadcasters, many of whom offer essentially locally oriented programming. Terrestrial broadcasting has the ability to provide local public affairs programming, local news and weather, local traffic reports and local personalities. We believe that consumers attach great significance to such programming. We request comment on whether consumers would alter their listening patterns by abandoning local stations to any significant degree. In this regard, we note that existing audio services provided at fixed locations by satellite do not appear to have adversely effected local radio broadcasting.

5. Implementation of satellite DARS potentially will stimulate significant economic growth by creating jobs in various sectors. Satellite DARS could create jobs in industries involved in technological development and manufacture of spacecraft and receiver components, installation of receivers in vehicles, programming creation and origination, building and operation of satellite uplink facilities and construction and operation of customer service centers. These activities will require employees with various levels of expertise and training. Moreover, many of these economic opportunities would be available to non-licensees, including small and minority owned businesses. Because the construction costs for the space stations proposed in the pending applications range from \$320 million to over \$622 million, and the manufacturing costs for their proposed ground segment(s), including the feeder link earth stations and the end user receivers, are expected to be millions of dollars more, satellite DARS potentially will lead to substantial investment in the U.S. economy.

6. The process of establishing DARS in the United States began in 1990 when Satellite CD Radio (CD Radio) filed a Petition for Rulemaking to allocate spectrum for DARS. At the same time, CD Radio filed an application to provide digital quality audio by satellite which was accepted as tendered for filing on October 19, 1990. In February 1992, the World Administrative Radio Conference (WARC 92) adopted international frequency allocations for satellite digital audio broadcasting.² Per U.S. proposals, the frequencies designated in this country are 2310-2360 MHz (S-Band). In November 1992, the Commission released a Notice of Proposed Rulemaking and Further Notice of Inquiry (Allocation Notice) proposing to implement the WARC 92 allocation domestically.³

7. The Commission established a December 15, 1992 cut-off date for applications proposing satellite DARS service to be considered in conjunction with CD Radio's application. In response to the cut-off notice, five additional applications were filed. As two of those five applicants have withdrawn, the remaining applicant pool consists of CD Radio, Primosphere Limited Partnership (Primosphere), Digital Satellite Broadcasting Corporation (DSBC) and American Mobile Radio Corporation (AMRC).

8. In its recent Allocation Order, the Commission amended the Table of Frequency Allocations to allocate 50 MHz of spectrum, 2310-2360 MHz, for satellite DARS use on a primary basis. The Commission further noted that this proceeding would be initiated to address satellite DARS implementation.

² International Telecommunication Union, Final Acts of the World Administrative Radio Conference (Malaga-Torremolinos, 1992). The Conference allocated use of the 2310-2360 MHz band in Region 2 solely to the U. S. and limited the introduction of broadcasting-satellite services (sound) to the upper 25 MHz (2335-2360 MHz) pending the action of a further conference to be convened no later than 1998. See Allocation Order, supra n. 1, at para 26.

³ Notice of Proposed Rule Making and Further Notice of Inquiry, 7 FCC Rcd. 7776 (1992).

9. In the DARS allocation proceeding we also addressed terrestrial digital technology that may permit licensees in our current AM and FM services to convert to digital transmission with CD quality sound. Two industry committees are studying technical standards that relate to this issue.⁴ We continue to fully support these activities, and when we receive the reports of these two committees, we will act expeditiously to consider changes to our rule to also permit AM and FM licensees to improve their service by offering digital sound.

II. DISCUSSION

A. Economic Impact on Existing Terrestrial Broadcasters and Impact on the Public Interest

10. When we allocated spectrum for satellite DARS last January, we stated that we would examine the effect that this new service could have on terrestrial broadcasting. In the Allocation Order we concluded that the allocation of frequencies for nationwide satellite DARS is consistent with our obligations under Section 307(b) of the Communications Act, which requires us to ensure equitable geographic distribution of radio services. Additionally, we stated that in our satellite DARS service rules proceeding, we would "request information on and consider all relevant and available information which addresses the impact of satellite DARS on traditional service".⁵ We noted the possibility that "competition from a new regional or national satellite radio service might diminish the financial ability of some terrestrial stations to provide local service"⁶ and listed a series of factors that might be relevant for analyzing the potential economic impact of satellite DARS.⁷

11. Evaluation of the potential impact on broadcasters should be made in the context of Section 7 of the Communications Act. Section 7 makes it clear that opponents of this new technology bear the burden to show that licensing DARS is inconsistent with the public interest. The public interest in this regard is the provision of services of value to the listening public and includes the protection of competition, not competitors. The economic impact of satellite DARS on existing radio broadcasters is relevant to this inquiry to the extent that such impact would predictably lead to serious loss of important services to consumers, taking into account the potential for future enhancements of terrestrial broadcasting by the introduction of new technologies and by appropriate changes in the Commission's rules for terrestrial broadcasting. In this section, we seek comment on how satellite DARS might affect terrestrial broadcasters and, consequently, affect the interests of the listening public. We also seek comment on what might be an appropriate regulatory response to such impact.

12. In the Allocation Order, we concluded that allocation of spectrum for satellite DARS was in the public interest. We cited several benefits the public would receive from this service. These include the provision of continuous radio service of compact disc quality, an increased choice of over-the-air audio programming and service to underserved and unserved areas. We noted that satellite DARS has the potential to provide new services to rural listeners, minority and ethnic groups, and non-English speaking audiences. Finally we stated that the service has the potential to provide opportunities for economic

⁴ See discussion infra at para 48.

⁵ Allocation Order, supra n. 1 at para 25.

⁶ Id. at para 24.

⁷ Id.

development and improve the U.S. position in the international marketplace.⁸ We continue to believe that satellite DARS has the potential to offer substantial benefits to the public. We request comment on this conclusion and on other possible public interest benefits that might accrue from this service.

13. We recognize that initiation of satellite DARS may not be without some costs to local broadcasters, particularly in the area of their advertising revenues. Specifically, although satellite DARS may increase the total amount of time spent listening to radio, satellite DARS may also reduce the audience for terrestrial radio. That reduction in audience may, in turn, reduce the advertising revenues available to local broadcasting. We seek comment on the potential and likelihood of such an impact, and its effect, if any, on the continued financial viability of traditional broadcasting and on the amount of local and public affairs programming that traditional broadcasters provide. We particularly seek comment on the effect of satellite DARS given the disparity between the services in the number of stations permitted to broadcast to each community as a whole, the number of commonly owned channels that will be available in each community, and the reach of each station in the two services.

14. We also seek comment on whether, and to what extent, satellite DARS may decrease terrestrial radio listenership. In addressing this, commenters should provide the models and assumptions underlying their predictions and answer, at a minimum, the following questions: What is the expected customer equipment cost and any subscription fee? What service will be provided on a partially or fully advertiser-supported basis? How much of satellite DARS listening will be in automobiles and how much will be at stationary sites? In responding, commenters should take account of the nature of the service provided. For example, listeners of CD quality music might be primarily in automobiles, but the same might not be true for children's programming or programming in languages other than English. Satellite DARS's impact on the local radio audience will also depend on the availability of terrestrial DARS, so commenters should include in their analyses their assumptions regarding the probable timetable for introduction of that service.

15. In estimating any decline in terrestrial radio audiences, we request commenters to consider the currently available alternatives to terrestrial radio and their impact on the terrestrial radio industry. Subscription packages of digital audio service already are available to U.S. households via cable and direct-to-home satellite transmissions. These services include Digital Music Express (DMX), which initiated service in September 1991. DMX currently offers digital audio service to cable subscribers through a satellite feed to a cable company or directly to commercial companies via a one meter satellite antenna.⁹ DMX's basic service offers thirty channels of digital audio with no voice-overs and no commercials. Those receiving directly from a satellite antenna also can choose an enhanced service offering seventy-seven channels of digital audio. Another company, Music Choice, offers similar digital audio services to cable customers and, through secondary vendor DirecTV, to DBS satellite system owners. What, if anything, does the impact of existing national digital audio systems on terrestrial broadcasting indicate about the potential impact of satellite DARS on terrestrial broadcasting? How does the added factor of mobile service proposed by satellite DARS proponents affect this analysis?

16. We also seek comment regarding advertising revenues that may be lost due to competition from satellite DARS. We note national advertising presently accounts for an estimated 17-18 percent of

⁸ Allocation Order at para. 22.

⁹ This service will soon be offered to Ku-band FSS residential dish owners with compatible equipment.

total radio advertising revenues and local advertising accounts for the other estimated 82-83 percent.¹⁰ In their analyses, commenters should treat separately the effect on national and local advertising revenues. In addressing the question of advertising revenues, commenters should consider the following factors: Will a loss of listeners to satellite DARS services that may not sell advertising reduce the quantity of radio advertising offered for sale? If so, would such a reduction cause the price of advertising to change? How would these factors, in turn, affect broadcast radio advertising revenues? For satellite DARS services that are based on advertising, advertising will most likely be sold on a national basis.¹¹ Commenters should address the impact of this additional competition for radio advertising dollars for small, medium, and large stations. Additionally, because of differences in demographics and other factors, not all advertising exposures are of equal value. Commenters should consider expected satellite DARS listening patterns in estimating the value of advertising exposures that might be lost to terrestrial radio. For example, is satellite DARS listening likely to be concentrated in morning and evening "drive time" periods and are advertising rates higher than average during those periods?

17. We also recognize that advertising revenue losses could significantly vary among local broadcasters. Therefore, we seek comment on whether, and the extent to which, local station characteristics, including, but not limited to, profitability, market share, programming format (including the share of local programming), the number of households in the market, and the number of stations in the market could affect a particular station's revenue loss. We specifically solicit comment on this issue with respect to terrestrial stations operating in small markets.

18. Because revenue losses may translate into reduced profit margins, reductions in services offered, or other operational changes, we seek comment on radio station profit margins, with data disaggregated by market size and other relevant station characteristics. We note that large numbers of radio stations apparently operate at losses¹² and request comment on how we should utilize reported accounting profitability data to assess radio station viability. In particular, we seek comment on whether any stations might offer less local programming or go off the air as a result of competition from satellite DARS service. The viability of a radio station is determined by a variety of factors, and consequently, comments should establish a credible connection between satellite DARS competition and any predicted impact on radio station viability.

19. To the extent that satellite DARS would result in advertising revenue losses or other adverse financial impacts for local terrestrial broadcasters, we seek comment on how such revenue losses would affect the public interest. In particular, how would DARS competition affect the programming that local radio broadcasters provide? While listeners could turn to satellite DARS services for national programming and advertising, we believe that even with spot beams, local news, weather, traffic, and public affairs programming could not practically be provided via satellite DARS. Would the advent of satellite DARS lead to changes in local programming, including news, traffic, and weather? What percentage of terrestrial audio broadcast programming is currently devoted to local issues? Does this percentage vary systematically with market size or station characteristics? Will competition from satellite

¹⁰ Average 1993-1994 estimates of Radio Advertising Bureau, Veronis & Suhler & Assoc. and McCann-Erickson, cited in Primosphere's January 1995 comments.

¹¹ We seek comment on the technical and economic feasibility of regionally or locally targeted advertising on satellite DARS services.

¹² See, e.g., National Association of Broadcasters Radio Financial Report 1992.

DARS give local broadcasters an incentive to provide more local programming, or less? How profitable is local programming? Are the potential risks of decreased local service greater in these areas? Will stations with strong local programming schedules benefit from increased audiences at the expense of stations without such programming? In what other ways would DARS financially affect a local broadcaster's ability to serve the public interest, convenience and necessity? In analyzing the effect of local broadcasters' revenue losses on the public interest, we also seek comment on the extent to which competition may spur incumbents to improve their service, thereby benefitting the public interest. We seek comment on innovative measures terrestrial radio stations may take to respond to competition from satellite DARS, particularly implementing digital transmission techniques in their own service offerings, and the impact of these measures on terrestrial radio's ability to compete. We also seek comment on any possible effects of satellite DARS on terrestrial radio not specifically mentioned herein and on local broadcasters' ability to continue to serve the public interest.

20. Given our concern about the effect of satellite DARS on local broadcasting, we seek comment on appropriate ways to evaluate such effects. In the course of normal, market-driven economic development some local broadcasters experience continuing losses. These broadcasters usually undergo extensive re-organization, often after a change in ownership. Occasionally, they actually turn in their broadcast licenses. How could we best determine if these failures reflect normal market conditions or whether they reflect significant problems in the local broadcasting industry resulting from competitive satellite DARS systems?

B. Design of Service

21. In establishing satellite DARS, our goal is to ensure that the listening public's needs are met by the most efficient and responsive service possible. To this end, we discuss below possible service requirements for satellite DARS. We solicit comment on these proposals. We also request comment on whether other service requirements are warranted. Commenters should explain and justify their analysis of each proposal, including consideration of the public interest benefits. Commenters should also indicate the extent to which their service rule proposals and analysis apply in the event that satellite DARS spectrum is auctioned.

1. Classification of Service

22. First, we seek comment on whether licensees should be able to determine their own regulatory classification or whether there are reasons to justify requiring them to provide service in a particular manner. Three of the four current satellite DARS applicants propose non-broadcast/subscription services. The fourth applicant, Primosphere, proposes to operate as an advertiser supported broadcast service.

23. Historically, all domestic satellite (domsat) operators were licensed to provide services on a common carrier basis.¹³ Shortly thereafter, domsat operators began to request authorization to provide service on a non-common carrier basis to particular customers. In response, the Commission established its transponder sales policy. Pursuant to this policy, the Commission relies on the analysis set forth in

¹³ See Amendment to the Commission's Regulatory Policies Governing Domestic Fixed Satellites and Separate International Satellite Systems, ___FCC Rcd ___, FCC 95-146 (released April 25, 1995).

NARUC I¹⁴ which identified two criteria as determinative of whether a service may be provided on a non-common carrier basis: 1) whether there are reasons implicit in the nature of the service to expect an indifferent holding out to the eligible user public and 2), if not, whether there is or should be any legal compulsion to serve the public indifferently. In the DARS service, there does not appear to be a reason to impose common carrier status on licensees. First, under the NARUC I criteria and based on the examples of applications on file, DARS providers will not be holding themselves out indifferently to serve the public but instead will be providing programming of their own selection. Further, we see nothing on the face of the applications or comments to suggest that it would be necessary to require that this service be common carrier.¹⁵ We request comment on this tentative conclusion.

24. A broadcasting service involves the transmission of programming intended for direct reception by the general public.¹⁶ In the context of developing service rules for DBS, a satellite based national programming distribution service, the Commission has held that a service offered pursuant to a subscription agreement using a scrambled signal is not broadcasting.¹⁷ Here, three out of four of the applications on file propose services offered pursuant to a private contractual relationship with the subscribing audience using a scrambled signal. Thus, it is clear that the intention of three applicants is to provide non-broadcast service within the meaning of Section 2.1 of the Commission's rules and Subscription Video.¹⁸ Accordingly, a requirement that all DARS licensees operate as broadcasters appears to be unwarranted and inappropriate. We request comments on this tentative conclusion.

25. As noted above, three of the four current applicants propose to operate in a subscription mode. These applicants also could accept advertising in conjunction with subscription fees or as a sole revenue source. NAB has requested that satellite DARS be authorized on a "subscription only" basis, arguing that to do so would differentiate satellite DARS from terrestrial stations and thereby help minimize harm to traditional broadcasting. NAB also posited that a subscription requirement would provide satellite DARS providers with the economic framework to permit delivering niche programming to specialized or geographically dispersed markets.¹⁹ We request comment on the legal, policy and practical implications of requiring DARS service to be provided on a subscription basis. We also request comment on whether advertising should or should not be permitted if this option is chosen, but tentatively conclude that requiring subscription service should not limit providers from accepting advertisements.

¹⁴ National Association of Regulatory Commissioners, 525 F. 2d 630 (1976 D.C.Cir.), cert. denied, 425 U.S. 999 (1976) (NARUC I).

¹⁵ Cf. Mobile Satellite Service, 2 FCC Rcd 485 (1987) at para. 34, where the Commission determined that because only one MSS system could be accommodated in the available spectrum, that system should be required to provide service on a non-discriminatory basis.

¹⁶ See 47 C.F.R. §2.1.

¹⁷ Subscription Video, 2 FCC Rcd 1001, 1006 (1987) (licensees that limit receipt of program services to paying subscribers are providing non-broadcast services); aff'd sub nom National Association for Better Broadcasting v F.C.C., 849 F. 2d 665 (D.C. Cir. 1988).

¹⁸ Id.

¹⁹ Letter to Chairman, FCC from President and CEO of NAB, May 3, 1995.

26. We could allow satellite DARS providers to tailor their services to meet the requirements of their targeted customers. Under this option, any regulatory classification of licensees would depend on their business choices. Further, once applicants are granted licenses, they would be free to tailor their DARS service offerings in response to market demand.²⁰ This approach is similar to that taken by the Commission in its 1982 rules to govern DBS.²¹ The Commission decided to avoid requiring DBS licensees to operate under a specified service classification. Instead, the Commission indicated that it would consider the particular services proposed by individual applicants in making any service classification decisions.²²

2. Public Interest Obligations

27. We seek proposals for and comments on possible public service rules for satellite DARS. In this regard, the Commission has the obligation to make licensing decisions that are consistent with the public interest, convenience and necessity.²³ In addition, licensees providing broadcast services are subject to specific public interest obligations. We seek comment on whether satellite DARS providers offering subscription or non-broadcast services should also be subject to similar public interest obligations. Commenters offering proposals on this issue are specifically requested to consider what public service offerings would not necessarily be provided absent regulatory obligations. Should public service rules be limited to licensees offering broadcasting services, those providing subscription services, or should they be imposed on all satellite DARS licensees? With regard to non-broadcast satellite DARS licensees, we seek comment on the Commission's authority under the Communications Act to regulate licensees in this manner. Commenters should also address any constitutional implications of imposing such public service obligations in light of Daniels Cablevision, Inc. v U.S.,²⁴ where the U.S. District Court for the District of Columbia struck down provisions of the 1992 Cable Act requiring certain public interest obligations for DBS operators, and rendered other relevant decisions. We recognize that public interest obligations would impose a cost on satellite DARS providers. We request commenters to estimate the cost of providing public interest programming. Are the estimated costs outweighed by the public interest benefits of more news and informational programming? Could these costs be so significant that they might potentially hamper the deployment and success of the service?

28. We seek comment on public interest requirements that terrestrial radio broadcasters face and on the impact of those requirements on the current and future profitability of terrestrial radio stations. We believe that this information will have predictive value in determining whether DARS providers should

²⁰ See Comments of Primosphere at 6 stating that consumer choice would be further expanded by a mix of subscription and advertiser supported services.

²¹ DBS is the only precedent we have for rules governing satellite broadcasting although direct-to-home service in the C-band appears the same to the viewer.

²² See Inquiry into the Development of Regulatory Policy in regard to Direct Broadcast Satellites for the Period Following the 1982 Regional Administrative Radio Conference, 86 FCC 2d 719 (1981) (NPRM); 90 FCC 2d 676 (1982) (Report and Order); aff'd sub nom National Association of Broadcasters v F.C.C., 740 F. 2d 1190 (1984).

²³ 47 U.S.C. §307 (a).

²⁴ 835 F. Supp 1 (D.D.C. 1983), appeals pending sub nom. Time Warner Entertainment Co. L.P. v FCC, No. 93-5349 and consolidated cases (D.C.Cir.).

be subject to similar obligations. For example, one of the major public interest obligations of terrestrial radio broadcasters is to provide reasonable access to their facilities for use by legally qualified candidates for federal elective office.²⁵ Radio broadcasters who permit use of their facilities by any legally qualified candidate must also afford equal opportunities to use such facilities to all other candidates for that office.²⁶ In addition, broadcasters are required to develop and carry out an EEO program designed to ensure that potential employees are not discriminated against on the basis of race, color, religion, national origin or sex.²⁷ Perhaps most importantly, broadcasters are obliged to serve the needs and interests of the members of their communities of license. As a means to this end, the Commission requires broadcasters to maintain lists of programs aired which address community issues.²⁸ Commenters are asked to discuss the following: What public interest offerings would not be included by service providers in an unregulated market environment? Do terrestrial radio public interest programming requirements increase profitability by providing valuable information to listeners or do they reduce profitability?

3. Ancillary Services

29. We also seek comment on whether licensees in the 2310 -2360 MHz band, allocated domestically for Broadcast-satellite (sound) on a primary basis, should be permitted to offer non-DARS services on an ancillary basis. If so, what limits, if any, should apply? The current satellite DARS applicants propose to offer additional services to their end users which are ancillary to DARS. These include high-speed broadcast data or location-based geographic information, electronic graphic/visual information, voice mail, and alphanumeric messages on dedicated channels or in conjunction with (multiplexed into) the channels used for digital audio.²⁹

30. Ancillary uses of allocated bands are legally permissible. For example, with regard to DBS, we permitted temporary ancillary uses of satellite spectrum.³⁰ We seek comment on whether ancillary uses should be permitted in this service and if so, how they should be defined, specifically in the context of satellite DARS. For example, since the principal use of the spectrum capacity is for satellite DARS audio programming, what percentage of the spectrum capacity could be devoted to ancillary services? In addition, how would we monitor such a requirement, particularly in a digital environment where different service offerings may not appear to be different from a technical perspective? Would a requirement to certify compliance and reliance on complaints be sufficient? Would such a requirement create an unwarranted burden on licensees?

²⁵ 47 U.S.C. §312(a); 47 C.F.R. §73.1944.

²⁶ 47 C.F.R. §73.1941.

²⁷ 47 C.F.R. §73.2080.

²⁸ 47 C.F.R. §73.3526(a)(9).

²⁹ See AMRC Application at 5, DSBC Application, Section C at 9, CD Radio Application at 35-36 and Primosphere Application, Appendix 1 at 20.

³⁰ This authority is subject to certain restrictions including compliance with technical power and transmission requirements that ensure home reception capability, initiation of DBS within the initial license term, provision of DBS service on the same transponder and ancillary service does not exceed 50% each day. See United States Satellite Broadcasting, Inc., 1 FCC Rcd. 977 (1986).

C. Licensing Approaches

31. In the Allocation Order, we adopted domestically the international frequency allocation of 50 MHz of spectrum for this service. To alleviate potentially difficult and lengthy coordination with other administrations, particularly Canada, we propose to initially license a maximum of 40 MHz.³¹ We now request comment on how much of this spectrum should be authorized for immediate use by DARS, how much spectrum should be assigned to each licensee, and the number of competitors that should be accommodated in the available spectrum. In connection with this, we request comment on the minimum number of channels necessary to provide effective and economically viable nationwide DARS service and on how much spectrum is necessary to support this minimum number of channels? We note that the four current satellite DARS applications propose various numbers of near CD quality channels for each system, e.g., 11, 23, 30, and 32 (16 CONUS channels and 16 additional channels in 31 spot beams). These applicants originally stated that their spectrum requirements to offer their channels were 10 MHz, 50 MHz, 20 MHz and 25 MHz, respectively. We also note that the ATV Grand Alliance system claims to have enough capacity to deliver 75 CD quality stereo channels in 6 MHz as a terrestrial service. We ask how many channels per megahertz can be delivered by satellite to mobile users.

32. How many service providers are necessary to provide competition in this market? To what extent would the existence of multiple DARS providers increase the likelihood that public interest benefits, including low consumer costs, can be achieved? To what extent are other licensing models, such as those used for DBS or PCS, helpful in making decisions regarding the number of satellite DARS providers? We also seek comment on how to assign spectrum that might become available if one or more applicants fail to implement their proposals. Should new applications be solicited, or should the spectrum be assigned in equal shares to the existing applicants?

33. In determining the entities eligible to be licensed in this service, we have identified three basic options: to license the available spectrum to the current four applicants; to license less than the total available spectrum to the four applicants and auction the remainder; or to accept new applications and auction all licenses. These approaches are described below and we seek comment on them and on any other alternatives. The first option would assign the available spectrum to the four applicants that filed in response to the Commission's 1992 cut-off notice. The spectrum would be divided equally among the qualified applicants. Assuming all four of the pending applications are qualified, each would be awarded a 12.5 MHz segment or, if we determine that the lower 10 MHz of spectrum is not available for assignment at this time, a 10 MHz spectrum segment.³² Two of the current applicants suggested the available spectrum be divided equally among the four. We seek comment on this proposal and whether a 10 MHz assignment would be feasible, *i.e.*, whether a viable satellite DARS service could be provided using a 10 MHz spectrum block.

34. We believe that this approach would recognize certain equities in favor of the current applicants. It has been almost five years since the first DARS application was filed by CD Radio. Since that time we have accepted CD Radio's application, accepted competing applications by establishing and issuing an official cut-off date notice, and allocated spectrum for DARS on a primary basis as had been requested in CD Radio's petition. These actions have been fully consistent with the procedures previously used in establishing other satellite services where applications are often accepted before the Commission

³¹ See discussion re international coordination, *infra* at paras 62-67.

³² See discussion *infra* at paras 62-67 regarding international coordination with Canadian terrestrial systems.

allocates spectrum and establishes service rules. Moreover, the Commission has held that adherence to cut-off procedures promotes " 'orderliness, expedition and finality' in the licensing process".³³ It has also found that in some instances, reopening the cut-off to new applications would delay the proceeding.³⁴ Applicants state that they have expended substantial sums of money in apparent reliance on the Commission's satellite cut-off procedures including filing and other application related fees and expenses. We seek comment on the merits of these and any other equities in favor of the current applicants and on the fairness of any action that would reopen the cut-off.

35. On the other hand, the satellite application cut-off procedures are in contrast to the practices followed in licensing other services. For example, in the broadcast service, applications are not accepted for filing and afforded cut-off protection until spectrum is allocated to the service, channels established and allotted to specific communities, and service rules are adopted. Similarly, in other recently established services such as broadband and narrowband PCS and Interactive Video Distribution Service (IVDS), we allocated spectrum and established licensing and service rules before accepting applications.³⁵ We seek comment on whether the public is better served by following the broadcast cut-off model or the satellite model. In this regard, we also seek to determine answers to a number of questions related to any equities of the four applicants presumably tied to reliance on continued Commission adherence to the satellite cut-off model. Specifically, what is the level of actual investment by the four applicants to date and how does that investment compare to the value of the spectrum and the potential sales value of a DARS license in an immediate, post-grant private transfer. How would the Commission assess the value of the contributions made by the current applicants in furthering the development of satellite DARS? If we were to reopen the proceeding for new applicants and we receive mutually exclusive applications, is it possible and desirable to compensate for such value in an auction environment by, e.g., assigning appropriate bidding credits to the current applicants?

36. A second option would be to designate a segment of less than the full amount of spectrum that we believe is useable at this time,³⁶ and to award the remaining spectrum to other new applicants. The spectrum designated for the current four applicants would still be divided equally, but the band segments ultimately licensed to each would be less than 10 MHz, either in equal segments or in segments of different amounts. Under this scenario, we would need to determine how much spectrum to keep for new applicants, whether the remaining spectrum can accommodate the pending applicants, how and for what purpose to license the spectrum not assigned to the four current applicants, and how to choose an additional applicant or applicants for the remaining spectrum. If any of the two band segments (*i.e.*, the spectrum band for current applicants and the spectrum band for new applicants) could not accommodate all applicants eligible to be licensed in each, we could assign the "mutually exclusive" band segment through the auction procedures proposed herein. This approach offers a compromise between a desire to acknowledge the equities in favor of the four current applicants and an interest in efficient spectrum

³³ See *Mobile Satellite Service*, 6 FCC Rcd. 4900, 4914 (1991). See also *Radio Athens, Inc. (WATH) v FCC*, 401 F.2d 398,400-01 (D.C. Cir. 1968); *John W. Talbott*, 60 FCC 2d 511, 513 (1976).

³⁴ *Mobile Satellite Service*, *id.*

³⁵ See, e.g., *New Personal Communications Services*, GEN Docket No. 90-314, 8 FCC Rcd. 7700 (1993), *recon.* 9 FCC Rcd. 4957 (1994) (broadband PCS); *ET Docket No. 92-100*, 8 FCC Rcd. 7162 (1993), *recon.* 9 FCC Rcd. 1309 (1994) (narrowband PCS); *Interactive Video and Data Services*, GEN Docket No. 91-2, 7 FCC Rcd. 1630, *recon.* 7 FCC Rcd. 4923 (1992).

³⁶ See discussion, *infra* regarding international coordination at paras 62-67.

management that auction procedures might achieve. We seek comment on all aspects of this option, including the minimum spectrum block required to provide a viable satellite DARS service, and its possible implementation.

37. A third option would be to re-open the processing window and allow additional applicants to file satellite DARS proposals. If this option is chosen, it is likely that additional applications will be filed and that a mutually exclusive situation could result. The Commission must then determine whether to assign licenses through lottery, comparative hearing or competitive bidding. We discuss a framework for a possible auction below. We seek comment on this option, including mechanisms such as an appropriate bidding credit or similar mechanism that would recognize the extent of investment by each of the four current applicants to date. We also seek comment on the magnitude of the expected recovery for the public of a portion of the value of this public spectrum resource made available for commercial use.

38. If auctions are used under option three, we propose to divide the 50 MHz of spectrum into blocks of an appropriate size³⁷ and license those spectrum blocks on a nationwide basis. Each applicant would be permitted to bid successfully on several blocks of spectrum, contiguous or not. This band plan would permit applicants to assemble blocks of spectrum best suited to the service that they intend to provide. The current satellite DARS applicants differ significantly regarding the digital signal coding rates needed to produce near compact disk (CD) quality sound. These differences translate into differences in the amount of spectrum required to transmit a channel of near CD quality music. Thus, while the applicants have apparently agreed that they can share the 50 MHz allocated, dividing the allocation evenly among them might not lead to optimal service to the public. We seek comment on whether, because satellite DARS will face competition from terrestrial radio services, CD players in automobiles and homes, and audio services delivered as part of cable and satellite services, there could be effective competition in delivery of audio services with fewer than four satellite DARS providers.

39. We seek comment on an appropriate band plan for option three and on whether a spectrum cap is needed. One band plan possibility is to divide the 50 MHz into 10 five MHz blocks. Alternatively, we could attempt to fashion a band plan for auctions that is more consistent with the plan to divide spectrum evenly among the four existing applicants. We seek comment on these options as well as on other alternatives. The purpose of a spectrum cap would be to ensure reasonable competition in the provision of near CD quality audio services. One spectrum cap possibility is 20 MHz. Under this option, if we were to divide the band into 5 MHz blocks, licensees could hold up to four blocks. We seek comment on this and on other spectrum cap possibilities.³⁸

40. With respect to option two, a combination of licensing the four applicants and possible auctions, the choice of a band plan would depend on the amount of spectrum that we would plan to auction. Similarly, the band plan would depend on whether all 40 MHz we expect to be initially available

³⁷ See discussion *infra* at paras 94-111 re auctions. If we use an auction to assign this spectrum, all 50 MHz could be auctioned because, in an auction, bidders can take account of the potential international coordination difficulties that encumber the lower 10 MHz of spectrum. If the lower 10 MHz is, in fact, less well suited to providing service, bids will be lower on that block than on the rest of the spectrum.

³⁸ We also seek comment as described in paras 57-59 on whether agreements between licensees to share cross polarized frequencies should count toward a spectrum cap should we adopt one.

should be licensed initially, or if some smaller amount should be licensed first and the remainder at a later time. In addressing this issue, we request that parties address how much spectrum and how many providers should be licensed as discussed below. Rather than propose a specific plan, we ask commenters to address the issues of how much spectrum to assign to each licensee and how to structure the plan.

D. Licensing Procedures

41. To enable us to license applicants as expeditiously as possible, we are proposing alternative licensing approaches that will be consistent with the three options outlined above. First, we propose service rules that will enable licensees to operate systems efficiently, avoiding harmful interference to other licensees. Second, we propose additional rules and licensing qualifications specific to a licensing approach based on Commission approval of the four current applicants. Finally, we propose auction procedures that would allow the Commission to implement such a selection method if it chooses to reopen the processing group to additional applicants.

1. Technical Rules

42. As in past satellite licensing proceedings, we propose technical requirements that reflect the unique nature of the service proposed and that promote entry opportunities for applicants.³⁹ Comments received throughout the allocation proceeding and in response to the filed applications, including the supplemental comments recently filed by CD Radio and DSBC, form the basis of our technical proposals. We seek comment on whether these proposals maximize spectrum and orbit resource efficiency. We seek additional comment on whether these technical rules will accomplish our goal to ensure that satellite DARS applications can be considered and the service can be implemented expeditiously.

a. Service Area

43. First, we seek comment on whether we should adopt rules mandating a service area coverage requirement for satellite DARS systems. Two of the four pending satellite DARS applications propose service solely to the 48 contiguous states of the United States (CONUS). Two propose coverage of the CONUS, Alaska, Hawaii, Puerto Rico and/or the Virgin Islands. Recognizing that there are areas outside the CONUS underserved by terrestrial broadcasting, we seek comment on whether to require satellite DARS systems to provide 50-state coverage or 50-state plus Puerto Rico/Virgin Island coverage, as we do in the fixed-satellite service.

b. Service Link Margin

44. Satellite DARS reception in any geographic area, including within the CONUS, and especially to mobile end users, depends heavily on the available service link margin for a high percentage

³⁹ In the domestic fixed-satellite service, for example, we adopted a full frequency reuse requirement for space stations to ensure spectral efficiency when it appeared that orbital locations were limited. See, e.g., Licensing Space Stations in the Domestic Fixed-Satellite Service, 101 FCC 2d 223 (1985), at paras. 11-12; see also, United States v. Storer Broadcasting, 351 U.S. 192 (1956).

of service availability.⁴⁰ The service link margin necessary for satellite DARS reception has been a topic of discussion throughout the comments on the satellite DARS proposals. Service link margin is related to satellite visibility which may be limited in some urban and suburban areas.⁴¹ Satellite visibility may also be limited in geographic areas outside of the CONUS where low elevation angles above the horizon from the end user to the DARS space station could lead to increased instances of signal blockage. An increase in signal blockage decreases the available service link margin of a satellite DARS system.

45. The service link margins identified in the pending satellite DARS applications range from approximately 4 dB to 14 dB.⁴² Parties question whether the satellite DARS proposals provide the amount of service link margin necessary for urban and suburban environments.⁴³ Comments do not offer technical analyses to demonstrate and specify the service link margin necessary for mobile reception in urban and suburban environments. The satellite DARS applicants do, however, propose several techniques to solve the complex problem of maintaining adequate service link margin in a mobile environment. DSBC, for example, notes that coverage in urban canyons may be enhanced by using rake receivers.⁴⁴ Two of the satellite DARS applicants propose to employ a frequency and satellite diversity system which they contend will maintain sufficient service link margin.⁴⁵

46. We propose that applicants be required to identify the service link margin for their systems and to demonstrate that their systems will provide that service link margin in a mobile environment, under clear sky conditions, to the geographic areas they intend to serve.⁴⁶ We also seek comment on whether a specific value should be used to define an adequate service link margin for the specified service areas in urban and suburban environments and, if so, what that value is and the analysis for it.

⁴⁰ Service link margin identifies the amount of excess received power available to the end user receiver in an ideal free-space propagation environment (where there is no signal blockage or attenuation from precipitation) to reproduce the information originally transmitted by the satellite.

⁴¹ Increased instances of signal blockage can be expected in suburban areas where there is heavy foliage and in "urban canyons" where tall buildings could limit satellite visibility and cause multipath interference (from reflected signals).

⁴² NPR notes that the satellite DARS proponents do not agree on an acceptable service link margin. See NPR Comments at 3.

⁴³ Advance Communications Corporation Comments at 3; NAB Petition to Deny Primosphere at 8.

⁴⁴ Rake receivers can aggregate and process CDMA signals, a technique which DSBC maintains is employed in the cellular telephone systems now implemented by some U.S. operators. See DSBC Opposition, Technical Response at 5-6. DSBC adds that it is committed to its proposed "system A", one of three systems proposed by DSBC in their original application which uses O-CDM technology. See DSBC Opposition at 20.

⁴⁵ In a proposed frequency and satellite diversity DARS system, identical audio programming information is transmitted from two space stations located approximately 30 degrees apart on two frequencies that are separated by approximately 20 MHz. It is argued that the two independent signals from the two space stations would arrive at the user simultaneously and the receiver would select the stronger of the two signals to effectively provide greater service link margin. See Primosphere Reply, Engineering Statement at 5; CD Radio Reply, Technical Appendix at 1.

⁴⁶ See para 43 supra.

c. Receiver Inter-Operability and Tunability

47. Comments on the satellite DARS applications raise the issue of whether the Commission should set receiver inter-operability standards for satellite DARS. Some parties contend that substantial benefits would be gained if a single standard is adopted.⁴⁷ Another party asserts that a single standard would encourage consumer investment in satellite DARS equipment and create the economies of scale necessary to make DARS receiving equipment affordable.⁴⁸ Multi-standard DARS receivers almost inevitably would be more expensive than single standard receivers. Parties did not address whether a single satellite DARS receiver design should be compatible with competing satellite DARS formats and/or terrestrial broadcasting services such as traditional AM and FM and planned digital in-band, on-channel (IBOC) DARS on AM and FM frequencies.

48. Testing and evaluation of proposed digital audio radio technologies has been on-going since 1991. As we noted in the Allocation Order, two industry committees are considering issues relating to DARS technical standards. The Electronic Industry Association's Consumer Electronics Group (EIA/CEG) is developing standards for terrestrial and satellite DARS and the National Radio Systems Committee (NRSC), sponsored jointly by EIA/CEG and NAB, is pursuing the development and implementation of standards for terrestrial DARS systems to operate in the AM and/or FM broadcast bands. Both committees are cooperating in testing DARS technologies. Laboratory testing is expected to be completed in June or July 1995. EIA/CEG currently plans to conduct field measurements in July and August 1995. A final report and recommendation is anticipated by the end of 1995.⁴⁹

49. One concern is that the additional cost to manufacture a receiver that is compatible with all competing satellite DARS and terrestrial formats may exceed the price range applicants are targeting for their individual satellite receivers.⁵⁰ We are further concerned that the market penetration projected by the satellite DARS applicants may not be attainable if the cost of individual satellite DARS receivers is too high. We request comment on the costs and benefits of adopting a single standard for satellite DARS.

50. We also seek comment on whether individual satellite DARS receivers should be remote command tunable across the entire 2310-2360 MHz band. This tunability would be accomplished by transmitting a signaling channel from the feeder link earth station, through the spacecraft and to the individual DARS receivers, and would be necessary for satellite DARS licensees to be able to operate in any portion of the allocated DARS frequency band. It would also be necessary to facilitate sharing among the different satellite systems according to our band sharing proposal. Applicants would therefore be required to demonstrate how they would implement the forward signalling command through the space

⁴⁷ NAB Reply at 4; Digital Cable Radio Comments at 8.

⁴⁸ AMRC Comments at 5.

⁴⁹ Ex Parte Statement filed by EIA Digital Audio Radio Subcommittee on March 15, 1995.

⁵⁰ The individual satellite receiver costs to the consumer are estimated by the applicants to range from \$50 to \$300. Individual satellite receiver cost estimates are based on existing technology. The standards for terrestrial DARS are still under development and it is difficult to determine the added cost to the satellite receiver to include this technology.

station for receivers to select and tune to any center frequency in the allocated bandwidth and demonstrate how the channelling plan seen by the end user would be affected.

51. We seek comment on the issue of receiver inter-operability standards for satellite and terrestrial DARS. Commenters should provide specific proposals that take note of the diverse modulation and channelling techniques of the satellite DARS applications before us and that the technology for terrestrial DARS is still being developed. We also encourage satellite DARS proponents to continue to participate actively in standards setting organizations such as the National Radio Systems Committee (NRSC) and the Electronics Industry Association (EIA). This will facilitate design of individual satellite DARS receivers according to state-of-the-art standards.

d. Data Rates

52. The four current satellite DARS applicants propose different digital signal coding rates which range from 128 to 384 kbps to produce near compact disc (CD) quality audio. Two satellite DARS applicants assert that CD quality audio is possible using a 128 kbps data rate.⁵¹ One applicant questions whether a data rate of 128 kbps is sufficient to provide the high level of signal quality needed to differentiate digital sound broadcasting from other sound broadcasting media.⁵² National Public Radio maintains that if acceptable audio quality is obtained at a bit rate of 128 kbps, then proposals using higher bit rates make inefficient use of the spectrum. It asserts further that if the lower bit rates are unworkable for high quality audio, however, then proposals employing them do not offer significant advantages over analog radio.⁵³

53. Moreover, some satellite DARS applicants propose to use variable data rates to transmit a mix of audio formats.⁵⁴ The bandwidth necessary to produce one CD quality channel, for example, would be used to provide several high quality channels at data rates which are lower than those necessary to produce CD quality.⁵⁵ Use of variable data rates would promote efficient use of the spectrum.

54. We believe that DARS system licensees should be permitted to implement a mix of audio formats at variable data rates. We therefore do not propose to limit the licensees to a single standard for digital audio coding. We propose, instead, that satellite DARS applicants be required to identify which coding scheme and coding rate(s) they plan to implement on their satellite DARS systems and require those satellite DARS systems which intend to offer audio formats other than CD quality to be capable of transmitting lower quality audio at lower data rates. An applicant that intends to implement variable data rates, therefore, would be required to demonstrate how its space station will deliver signals at variable rates and how its individual satellite DARS receivers would be capable of adjusting the coding rate to provide less than CD quality audio channel selections to the end user. We propose to refrain from

⁵¹ DSBC Application, Appendix I at 10. CD Radio maintains that the technical feasibility of CD quality delivery at 128 kbps has been confirmed. CD Radio Opposition to Deny and Response at 37.

⁵² Primosphere Comments at 11.

⁵³ NPR Comments at 3.

⁵⁴ AMRC Application at 5, Primosphere Application, Appendix 1 at 1; DSBC Application, Appendix I at 3.

⁵⁵ These high quality channels would be comparable to FM stereo or FM monaural and could be used to provide less demanding radio formats such as talk radio, sports and news.

requiring a particular level of audio quality or other quality for satellite DARS. We seek comment on this conclusion.

e. Terrestrial Gap Fillers

55. As previously discussed, signal blockage and multipath interference can affect the service link margin of a satellite DARS system. It is important for the satellite DARS systems to maintain sufficient service link margin to reproduce the original information transmitted by the satellite. Some satellite DARS applicants indicate that they intend to implement, as they find necessary, terrestrial repeaters, or "gap-fillers", in urban canyons and other areas where it may be difficult to receive DARS signals transmitted by a satellite. These terrestrial gap-fillers would re-transmit the information from the satellite to overcome the effects of signal blockage and multipath interference. None of the satellite DARS applicants, however, provided the necessary technical information in their applications to demonstrate how these complementary terrestrial repeater networks would be implemented. The proposed rules for satellite DARS provided in the supplemental comments include a number of provisions for complementary terrestrial networks, however.

56. We are not proposing rules to govern complementary terrestrial gap-fillers at this time because we do not have sufficient information. We request comment on whether separate applications for complementary terrestrial DARS authorization should be required to identify the number and locations of these terrestrial repeaters and also their operating frequencies. We request comment on whether, if a large number of gap fillers is required, there comes a point at which the service becomes essentially a terrestrial rather than a satellite service. We also request comment on other specifics of operation that would have to be identified. This would include whether the gap-fillers would require a bandwidth the same as the satellite's and whether the gap-fillers use the same frequencies as the satellite transmitters. If other frequencies would be used, what would they be? How would the end user tune the receiver to receive the signal, or would this be done automatically by the receiver according to signal strength? Until such information is available and applicants demonstrate how these complementary terrestrial networks would be implemented in the overall satellite system design, we cannot determine if terrestrial gap-fillers should be permitted and what rules should govern their use. Because gap-fillers are complementary to the satellite service, we propose to prohibit their operation except in conjunction with an operating satellite DARS system.

f. Cross Polarized Emissions

57. Cross polarized signals are orthogonal signals as seen by the receiver.⁵⁶ This technique is used extensively in the fixed-satellite service because it facilitates re-use of frequencies to accommodate multiple signals. It is proposed by the two parties filing Supplemental Comments that each licensee with an operational system may employ cross polarization within its frequency assignment and may transmit cross polarized signals in another licensee's frequency assignment under mutual agreement with that licensee.

58. Parties in this proceeding, however, disagree on the feasibility of cross polarization for multiple entry in a mobile environment. CD Radio maintains that sufficient cross-polarization isolation

⁵⁶ Two signals which are orthogonal can occupy the same frequency. The cross polarization isolation achievable between two signals determines the practicality of two signals occupying the same bandwidth.

can be attained to permit use of cross polarization as a service enhancement for satellite DARS.⁵⁷ However, AMRC contends that cross-polarization will not be effective for transmission to mobile users since mobile receivers typically will not be able to discriminate cross-polarized signals after the polarization reversal effects of multipath reflections.⁵⁸

59. The record is insufficient for us to analyze the benefits of potential capacity increases, if any, that may result from use of cross-polarized transmissions. It is not clear whether optimum cross-polarization isolation would be available to allow use of this technique for multiple entry in a mobile environment. However, licensees may be able to use this technique as a means of increasing system capacity.⁵⁹ We therefore propose that satellite DARS licensees, pursuant to mutual agreement with other satellite DARS licensees, may transmit on cross polarized frequencies in frequency assignments of other licensees.⁶⁰ We seek comment on whether any mutual agreements to share cross polarized frequencies should be subject to a spectrum cap should one be adopted.⁶¹ Licensees who come to mutual agreement on the use of cross-polarized transmissions would be required to notify the Commission and demonstrate that cross-polarization sharing is feasible under shadowing and multipath conditions. The parties who achieve mutual agreement would also be required to apply to the Commission for approval of the agreement. Approval would be conditioned on the outcome of coordination with other administrations.

g. Inter-service Sharing

60. The issues related to inter-service sharing and, specifically, international coordination, are relevant regardless of the licensing option the Commission chooses to adopt, including an auction of spectrum. Satellite DARS licensees are required to coordinate with other Administrations over that portion of the 2310 - 2360 MHz band they are exclusively licensed to operate. Licensees may also reach mutual agreements with other licensees to maximize efficient use of the spectrum. Licensees would be required to submit their agreement to the Commission for authorization and would be required to coordinate their exclusive frequency assignments. We seek comment on any of the proposed requirements which follow and any additional requirements that would be necessary to facilitate international coordination in the most efficient manner, under any licensing approach.

⁵⁷ CD Radio Response, Technical Response at 1-2. CD Radio notes that its antenna manufacturer states a 24.8 dB cross polarization isolation level. CD Radio maintains further that an occasional reflection causing the cross polarization isolation to fall from 20 dB to 9 dB causes only a 0.5 dB reduction in Eb/No.

⁵⁸ AMRC Reply Comments, Technical Appendix at 4. AMRC maintains that in a shadowing and multipath environment, cross-polar isolation levels can be expected to be only 11-12 dB which is significantly less than the traditionally accepted allowable limit of 20 dB for inter-system interference. See AMRC Application at 8 citing Propagation Effects for Land Mobile Satellite Systems: Overview of Experimental and Modeling Results, Goldhirsh and Vogel, NASA Reference Publication 1274.

⁵⁹ We note that two of the pending applicants propose a frequency diversity system. If the available bandwidth is equally divided and licensed to the four pending satellite DARS applicants, it would be necessary for the two licensees implementing a frequency diversity system to reach mutual agreement with other satellite DARS licensees to operate on cross-polarized frequencies in those licensees' band segments.

⁶⁰ See proposed section 25.214, Technical requirements for space stations in the digital audio radio service.

⁶¹ See discussion, supra at para 39.

i. Domestic

61. The Commission noted in the Allocation Order that by allocating the 2310 - 2360 MHz band to satellite DARS, it would be necessary to accommodate aeronautical telemetry services now operating in the 2310 - 2390 MHz band in the upper portion of the band from 2360 - 2390 MHz. The aeronautical telemetry community supported this re-accommodation.⁶² Footnote US328 was therefore added to Section 2.106 of our rules which allocated satellite DARS in the 2310 - 2360 MHz band on a primary basis. Continued use of the 2310-2360 MHz band by aeronautical telemetry and radiolocation users will be on a secondary basis only.⁶³ There is no need, therefore, to develop specific rules or coordination provisions for inter-service sharing between satellite DARS and existing users of the 2310 - 2360 MHz band in the U.S.

ii. International

62. Both Canada and Mexico are allocated the 1452 - 1492 MHz frequency band (L-band) for satellite and/or terrestrial DARS. Since U.S. satellite DARS systems will operate in the 2310 - 2360 MHz frequency band (S-band), coordination between U.S. satellite DARS and satellite and/or terrestrial DARS systems of adjacent countries is not necessary. Canada does, as we describe below, operate fixed terrestrial point-to-point microwave and mobile aeronautical telemetry systems in the 2310 - 2360 MHz band and the U.S. satellite DARS systems will be required to coordinate with these systems. We also note that the U.S. government uses the 1452-1492 MHz band extensively for mobile aeronautical telemetry operations and coordination of Canadian satellite and/or terrestrial DARS could be extremely difficult for U.S. government systems. This difficult coordination at 1452-1492 MHz between Canadian DARS and U.S. government systems could impact the coordination of U.S. satellite DARS systems with Canadian systems at 2310-2360 MHz.

63. CD Radio conducted an independent study which analyzes the coordination of U.S. satellite DARS systems with Canadian terrestrial systems in S-band and submitted it to the Commission.⁶⁴ This study identifies that the 2310-2350 MHz band is allocated, in Canada, for Fixed Service and Multipoint Communications Systems. The 2350 - 2360 MHz band is allocated for Mobile Telemetry.⁶⁵ The majority of Canadian fixed terrestrial systems operate in the lower 10 MHz of the 2310 - 2360 MHz

⁶² Allocation Order, supra n. 1 at 13.

⁶³ Footnote US328 states "In the band 2310 - 2360 MHz, the mobile and radiolocation services are allocated on a primary basis until January 1, 1997 or until a broadcasting-satellite (sound) service has been brought into use in such a manner as to affect or be affected by the mobile and radiolocation services in those service areas, whichever is later. The broadcasting-satellite (sound) service during implementation should also take cognizance of the expendable and reusable launch vehicle frequencies 2312.5, 2332.5, and 2352.5 MHz, to minimize the impact on this mobile service use to the extent possible." See Report and Order, GEN Docket No. 90-357, Released January 18, 1995, at 18.

⁶⁴ Letter to Chief, Satellite Radio Branch regarding the Coordination of 2310-2360 MHz with Canada (Coordination Study), dated February 14, 1994.

⁶⁵ Coordination Study at 3.

band.⁶⁶ It is also noted that 11 aeronautical telemetry base stations operate in the 2350 - 2360 MHz band. The majority of these base stations are located at high latitudes, however, where reduced power flux-density, the measured power of the satellite transmission in a specified area and bandwidth, would be received at the Earth's surface from the U.S. DARS satellite.⁶⁷

64. CD Radio also argues that coordination of satellite DARS systems would be facilitated if all systems were required to meet a power flux-density (pfd) level at the Earth's surface of -139 dB(W/m²/4kHz). It maintains further that the failure to meet this limit by any of the satellite DARS operators would lead to delays in service initiation by all licensees. DSBC disagrees with CD Radio regarding its proposal to require pfd limits on satellite DARS downlink transmissions. It adds that there is no pfd limit in the international Radio Regulations or the Commission's Rules for the 2310-2360 MHz band.

65. DSBC is correct that there is no pfd limit or threshold level to trigger coordination specified in the international Radio Regulations or in the Commission's Rules. We do not propose to require limits here. Further, our band sharing proposal could allow coordination of U.S. satellite DARS systems to proceed independently if necessary. It is therefore not likely that one satellite DARS operator would delay the coordination and implementation of other satellite DARS systems in the event the pfd at the Earth's surface is greater than -139 dB(W/m²/4kHz) for each system. Applicants are reminded, however, that they are required to identify in their satellite DARS system applications the pfd at the Earth's surface from their spacecraft according to Section 25.114 (c)(11) of the Commission's Rules.

66. To alleviate the potentially difficult and lengthy coordination with other administrations, especially Canada, we propose to consider only spectrum above 2320 MHz for initial U.S. satellite DARS systems unless we decide to auction this spectrum.⁶⁸ We believe our proposal will equitably distribute the allocated satellite DARS spectrum. We further note that the Supplemental Comments propose that the first satellite DARS licensee(s) assigned spectrum would be authorized use of the uppermost available frequency assignment. It appears from the Coordination Study and the Supplemental Comments filed that the Canadian aeronautical base stations located in the upper portion of the 2310 - 2360 MHz band could be less difficult to coordinate than the fixed terrestrial stations located in the lower portion of the band. We request specific comment on whether our conclusions are correct.

67. Our proposal is to require that each satellite DARS licensee coordinate with other Administrations over that portion of the 2310 - 2360 MHz band they are exclusively licensed to operate. Since we propose to allow satellite DARS operators under mutual agreement with other licensees to

⁶⁶ According to the Coordination Study, 186 of 213 Canadian terrestrial stations operate between 2310 - 2320 MHz. The remaining terrestrial networks are distributed relatively evenly across the 2320 - 2360 MHz band. See Coordination Study at 14.

⁶⁷ Coordination Study at 7. We note, however, that the Coordination Study is based on CD Radio's operating parameters and design. CD Radio does not propose to serve high latitude areas, such as Alaska, where pfd levels at the Earth's surface as high as those necessary to provide satellite DARS to the CONUS would be required. CD Radio's design therefore allows for a reduced pfd level at the Earth's surface in high latitude areas and the potential for harmful interference to Canadian terrestrial systems would be minimized.

⁶⁸ See discussion supra at paras 94-111. We note that CD Radio also suggests the potential for interference to a large majority of Canadian terrestrial systems could be avoided if the lower portion of the 2310 - 2360 MHz band is not implemented. See Coordination Study at 4.

transmit on cross polarized frequencies, we propose that licensees who come to mutual agreement apply to the Commission for approval of the agreement before coordination is initiated with other administrations by the licensee of the exclusive frequency assignment. The coordination process would begin after the systems' pertinent information is provided to the Commission for the advance publication, coordination and notification of frequency assignments pursuant to the international Radio Regulations as required by Section 25.111(b) of our Rules. We request comment on whether these proposals would require change if the proceeding is reopened and spectrum is auctioned.

iii. Adjacent Band Services

68. Space Research has a primary allocation in Region 2 for deep space operations in the 2290-2300 MHz band. This radiocommunication service uses spacecraft or other objects located two million kilometers or more from Earth for scientific or technological research purposes. As AMRC maintains, it is important that this service remain protected from emissions that may be produced by operating satellite DARS transponders in the 2310-2360 MHz band.

69. Satellite DARS licensees must suppress emissions outside of the 2310-2360 MHz band to an acceptable level according to Section 25.202(f) of our rules. Techniques such as spectral shaping, coding, offset quadrature phase modulation and filtering, we believe, will minimize these emissions.⁶⁹ We solicit specific comment, however, on the levels of out-of-band emissions from satellite DARS space stations necessary to protect deep space operations and other radiocommunication services operating below the 2310-2360 MHz band and U.S. aeronautical telemetry systems which are to operate in the 2360-2390 MHz band.

h. Feeder Links

70. In addition to the service links from the space station to the mobile, portable and fixed DARS receivers, one, or possibly more, feeder uplink earth stations in each satellite DARS system are required to transmit the audio programming information to be received by the end user. The feeder link portion of the satellite DARS network is essential to deliver service to the end user and ample contiguous spectrum is necessary to implement a viable satellite DARS service.

71. We do not propose a separate allocation of spectrum specifically for DARS feeder link use, however. Satellite DARS feeder link earth stations will operate at fixed locations and therefore are to be operated within fixed-satellite service (FSS) allocations. We propose not to permit, for DARS feeder links, use of the conventional FSS 4/6 GHz (C-band) and 12/14 GHz (Ku-band) frequency bands already used for U.S. fixed-satellite services.⁷⁰ We do not believe that satellite DARS feeder links operating in the conventional C-band and Ku-band FSS frequencies at orbital locations between 60 to 145 degrees west longitude would be an efficient use of the geostationary orbit and FSS spectrum. The DARS space

⁶⁹ CD Radio contends that by employing these techniques, they can operate their transponders and achieve the out-of-band emission requirements specified by Section 25.202(f) of our rules. CD Radio Motion to Accept Additional Pleading at 3.

⁷⁰ The FSS frequency bands 3700-4200 MHz / 5925-6425 MHz (C-band) and 11.7-12.2 GHz / 14.0-14.5 GHz (Ku-band) are heavily used for domestic and separate international system FSS operations and are not available for satellite DARS feeder link operations. As a matter of licensing policy, we determined that MSS feeder link and similarly RDSS feeder links, should be at frequency bands other than those already used by domestic fixed satellites. See *Mobile Satellite Service*, 4 FCC Rcd. 604, 6050 (1989).

stations do not require the entire 500 MHz of spectrum allocated to the FSS in these conventional bands. Use of these frequency bands for satellite DARS feeder links would therefore preclude an FSS space station from using those particular orbital locations and spectrum for conventional FSS services and inhibit the fungibility of these orbit locations for future domestic FSS assignments.

72. The satellite DARS applicants propose feeder link operations in FSS bands other than the conventional 4/6 and 12/14 GHz bands⁷¹ and comments were received on these proposals. Broadcast auxiliary users at 7 GHz generally agree that the portions of the satellite DARS applications which pertain to feeder link operations in the 7 GHz band should be denied.⁷² They contend that the broadcast auxiliary bands are heavily used for electronic news gathering, inter-city relays and studio-to-transmitter links and that use of the 7 GHz band for satellite DARS feeder link operations would not be feasible.⁷³ There has been no indication from the satellite DARS applicants which propose to use the 7 GHz band for feeder links whether mobile Electronic News Gathering (ENG) equipment would cause interference to satellite receivers. We request comment on this matter.

73. We note, however, that satellite DARS feeder link earth stations would undoubtedly employ highly directive antennas at high elevation angles. It is likely that satellite DARS feeder links in the 7025-7075 MHz band could be coordinated to operate compatibly with fixed point-to-point terrestrial TV broadcast auxiliary microwave stations. We also recognize that the mobile nature of ENG operations in the 7 GHz band could make coordination difficult in areas where ENG is heavily used. We therefore believe that in those markets where TV broadcast auxiliary stations are fixed links and light ENG use is presently conducted at 7 GHz, a carefully engineered and coordinated satellite DARS uplink may well be able to co-exist with point-to-point terrestrial TV broadcast auxiliary microwave stations.

74. We propose not to delay the licensing and implementation of the space segment for satellite DARS. We are encouraged that sufficient non-congested FSS frequency bands will be available for use for satellite DARS feeder link operations. We also recognize that, in light of our proposed band sharing plan, feeder link requirements for each satellite DARS system may change. To this end, we are placing the satellite DARS applicants on notice that the bands which have been indicated in their initial satellite DARS applications for feeder link operations may not be available and they may consequently be required to modify their system designs. Applicants should identify in their amended satellite DARS applications which non-congested FSS frequency band it proposes for feeder link operations, and should identify alternative non-congested FSS frequency bands that would be suitable for its feeder link operations.

75. In addition, we will act on the space station and earth station filings for satellite DARS separately. Choice of earth station sites and frequencies is typically provided in an earth station

⁷¹ Primosphere proposes use of 50 MHz in the 7025-7075 MHz frequency band, AMRC proposes use of 10 MHz in the 6530-6545 MHz frequency band, DSBC proposes use of 355 MHz in the 6500-6855 MHz frequency band and CD Radio proposes use of 20 MHz in the 7035 -7055 MHz band. Primosphere Application, Appendix 1 at 2, AMRC application at 12, DSBC application, Appendix I at 34, and CD Radio Application at 23.

⁷² Comments of Society of Broadcast Engineers at 3.

⁷³ Association for Maximum Television at 2, NPR Further Comments at 8; SBE Informal Objections at 2.

application as well as analyses to determine the impact on existing users of the frequency bands.⁷⁴ Satellite DARS applicants that propose to use the 7 GHz band for feeder link operations, for example, would be required in their earth station filing to demonstrate that no mutually unacceptable interference exists with broadcast auxiliary and mobile ENG users in the band.⁷⁵ Satellite DARS applicants are also cautioned that feeder link operations for non-geostationary MSS networks are proposed in non-congested FSS frequency bands.⁷⁶ In this regard we invite comment on the feasibility of satellite DARS feeder link networks and non-geostationary MSS feeder link networks operating compatibly in the same frequency bands.

2. Rules Applicable to a Licensing Approach Based on the Four Current Applicants

76. In addition to the generic technical proposals that would apply to any satellite DARS applicant, we also propose several specific rules and licensee qualifications that will allow prompt action on the four current applications if the Commission chooses not to reopen the processing group.

a. Intra -Service Sharing

77. The four pending satellite DARS applications, as originally filed, have combined spectrum requirements which exceed the 50 MHz of spectrum allocated for satellite DARS. The four applicants also propose system designs which differ in channelling plans, modulation schemes, and multiple entry techniques.⁷⁷ The applicants have made efforts, however, to demonstrate that their applications are not mutually exclusive and, as a result, two of the applicants have submitted proposed rules for satellite DARS intra-service sharing. On November 9, 1994, CD Radio filed supplemental comments including, among other proposals, a plan that would permit each of the four applicants to share the available spectrum on an equal basis.⁷⁸ CD Radio filed the proposed rules on behalf of itself but stated that they were a result of negotiations among the parties. It stated that no final agreement was reached on all of the rules but that, to CD Radio's knowledge, no controversy among the applicants exists over spectrum sharing. Indeed, DSBC replied to CD Radio's supplemental comments and submitted its own proposals, stating that any differences between its proposals and CD Radio's proposals can be harmonized and should not

⁷⁴ See Section 25.130 of the Commission's Rules, Filing requirements for transmitting earth stations.

⁷⁵ Satellite DARS licensees shall take whatever steps necessary to avoid mutual interference with broadcast auxiliary and mobile ENG users in the 7 GHz band according to Section 74.604 of the Commission's Rules.

⁷⁶ Considerable work, both domestic and international, has been completed to determine the feasibility of non-geostationary MSS feeder link operations using reverse band working in certain FSS bands below 17 GHz. FCC proposals for WRC-95 reflect the outcome of ITU-RS Task Groups 4/5 and 8/3 which studied this issue. See Second Notice of Inquiry, ___ FCC Rcd ___, 60 Fed. Reg. 8894 (Feb. 16, 1995).

⁷⁷ CD Radio, Primosphere and AMRC, for example, propose to time division multiplex a number of signals into a composite channel but DSBC proposes use of orthogonal code division multiplexing (spread spectrum). CD Radio, Primosphere, and DSBC propose use of cross polarization to provide for multiple systems in the 50 MHz of allocated spectrum. AMRC, however, asserts that use of cross polarization for multiple entry would not be feasible.

⁷⁸ These Supplemental Comments are being considered as a petition for rulemaking. See RM 8610.

block the development of an NPRM.⁷⁹ The Supplemental Comments propose a band segment approach for intra-service sharing to avoid imposing complex sharing arrangements on satellite DARS licensees that may result from the wide diversity in satellite DARS system designs. We propose to use this approach as a basis for our proposed rules and intra-service sharing arrangement if we determine to license the four current applicants and do not accept additional applications. Applicants would be permitted to amend their applications to conform with the sharing approach, if adopted.

78. Based on preliminary technical analysis, we believe that the four pending applicants should be able to operate over 40 MHz of the available spectrum, with each assigned to a minimum spectrum block of 10 MHz. We base this on the coding schemes and channeling plans presented in the originally filed applications. It is also based on the provision in our proposed rules that licensees would be permitted to operate on the cross polarized frequencies of other licensees' assignments under mutual agreement. This approach would accommodate the pending applicants, even assuming that the lower 10 MHz of the allocated DARS spectrum is not readily available for DARS licensing because of interference constraints. We request comment on whether our tentative conclusion is correct that exclusive assignment of 10 MHz of spectrum is sufficient for each proposed satellite DARS system.

i. Band Segments

79. The Supplemental Comments identify the term "usable bandwidth". Both DSBC and CD Radio define the term as that portion of the 2310-2360 MHz band that is usable by satellite DARS licensees. DSBC more specifically defines the usable bandwidth as the 2310-2360 MHz band, and indicates that this may be changed by the Commission or by mutual agreement of the satellite DARS licensees. Nevertheless, it was proposed that the usable bandwidth be divided into four frequency assignments and that these frequency assignments be distributed equally among the four pending applicants from the initial processing group. Should any system license be cancelled, it is proposed that the usable bandwidth be re-divided, pro-rata, among the remaining licensees.

80. We propose a similar band sharing approach but based specifically on 10 MHz band assignments. As discussed elsewhere in this NPRM in further detail, due to the number of Canadian fixed point-to-point microwave facilities in the lower 10 MHz (2310-2320 MHz) portion of the band, a satellite DARS licensee assigned these frequencies would experience relatively greater coordination difficulties with Canadian terrestrial services than those licensees assigned to the upper 40 MHz (2320-2360 MHz).⁸⁰ It therefore appears that the proposals submitted in the Supplemental Comments could lead to an inequitable coordination burden for the licensee assigned the lower 10 MHz of the DARS band. If we decide not to accept additional applications, we propose to divide the 2310-2360 MHz band into five equal 10 MHz bands and to assign each satellite DARS licensee a minimum of 10 MHz of exclusive spectrum located in one of the four 10 MHz bands above 2320 MHz. The term "usable bandwidth" defined by the applicants would therefore be considered as the 2320-2360 MHz band in our proposal. We also propose to allow licensees to use the channelling plans, modulation schemes, and multiple entry techniques of their choice in their exclusive frequency assignments as proposed in the Supplemental Comments. In addition,

⁷⁹ DSBC suggested somewhat different rules for financial qualifications, the authorization duration and time of frequency assignments, and authorization of interim frequency assignments but it did propose a spectrum sharing plan consistent with CD Radio's plan.

⁸⁰ See discussion on inter-service sharing with Canadian terrestrial systems, supra at paras 62-67.