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Satellite Policy Branch
International Bureau

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of)
)
Satellite CD Radio, Inc.)
)
Application to Modify Authorization)
to Launch and Operate a Digital Audio Radio)
Satellite Service in the 2320.0-2332.5 MHz)
Frequency Band)

COMMENTS OF XM SATELLITE RADIO INC.

XM Satellite Radio Inc. ("XM Radio"), hereby comments on the above-captioned application of Satellite CD Radio, Inc. ("CD Radio") to modify its authorization to launch and operate a Digital Audio Radio Service ("DARS") system.^{1/} XM Radio is concerned that the proposed deployment of non-geostationary satellites is a major change in the baseline for DARS system design that will make receiver interoperability substantially more difficult. In addition, the proposed modifications may cause an unacceptable level of interference to co-channel facilities in Central and South America. Finally, XM Radio urges the Commission to require CD Radio to submit the required filing fee.

Background

XM Radio. XM Radio is one of two satellite DARS licensees in the 2320-2345 MHz band. XM Radio received its license on October 16, 1997, and since then has made significant progress in the development of its DARS system. XM Radio has formed agreements with satellite manufacturers, launch service providers, developers of radio receivers, and programming providers essential to the success of the DARS system.

^{1/} See Public Notice, Report No. SAT-00009 (January 7, 1999).

With respect to its satellites, XM Radio signed an agreement on March 20, 1998 with Hughes Space and Communications International, Inc. ("Hughes") for the manufacture of three satellites. Under the terms of this approximately \$500 million contract, Hughes has agreed to develop and construct three XM Radio high-power HS 702 satellites. Hughes will provide a satellite control center, as well as launch and operational support service for the satellites. As part of the contract, Alcatel Espace is developing and manufacturing the communications payloads. XM Radio's satellites are currently scheduled to be launched during the third and fourth quarters of 2000, with initiation of commercial service planned for the fourth quarter of 2000.

In November 1998, XM Radio reached important agreements with Alpine Electronics, Inc., Pioneer Electronic Corporation, and the Sharp Corporation for the design, manufacture, and distribution of XM-capable radios and audio systems for the U.S. market. Alpine and Pioneer will build and distribute radios capable of receiving XM Radio programming for the automobile market, while Sharp will provide integrated XM audio systems for the home listening market. STMicroelectronics will design, build, and market computer chips to process the digital signal for the new XM radios.

CD Radio's Modification Application. On October 10, 1997, the FCC granted CD Radio authority to launch and operate a "satellite system in the geostationary-satellite orbit ("GSO")" in order to provide DARS.^{2/} On December 11, 1998, CD Radio filed an application to modify its authorization to, among other things, switch from CDMA to TDMA technology, increase the number of satellites from two to three and to place all three satellites into inclined and elliptical non-geostationary ("NGSO") orbits.

^{2/} *Order and Authorization, Satellite CD Radio, Inc., ¶ 1 (1997) ("CD Radio Authorization").*

Discussion

I. CD Radio's Proposed Non-Geostationary Satellite System Will Make Receiver Interoperability Substantially More Difficult

Two of the constants of the DARS rulemaking have been the consensus that the DARS systems would use geostationary satellites and offer receiver interoperability. In all the DARS applications and the Commission's notices and orders in the application process and the rulemakings, the parties and the Commission continually and without exception have referred to DARS systems as using geostationary satellites.^{3/} Though more recent, there has been a similar consensus regarding the need for receiver interoperability.^{4/} The Commission, DARS applicants,

^{3/} See e.g., Order, Digital Satellite Broadcasting Corp. and Primosphere Limited Partnership, 13 FCC Rcd 8976 (Int'l Bureau, 1997) (dismissing the applications of DSBC and Primosphere for authority to launch and operate GSO DARS systems); Order and Authorization, Satellite CD Radio, Inc., 13 FCC Rcd 7971 (Int'l Bureau, 1997) (authorizing CD Radio to launch and operate a GSO DARS system); Order and Authorization, American Mobile Radio Corporation, 13 FCC Rcd 8829 (Int'l Bureau, 1997) (authorizing AMRC to launch and operate a GSO DARS system); Report of the Satellite Digital Audio Radio Service Pioneer's Preference Review Panel: Request for Comments, 1996 FCC LEXIS 6398 (1996) (rejecting Pioneer's Preference requests of applicants for authority to launch and operate GSO DARS systems); Report and Order, Establishment of Rules and Policies for the Digital Audio Radio Satellite Service in the 2310-2360 MHz Frequency Band, 12 FCC Rcd 5754 (1997) (establishing licensing and service rules for "satellite DARS systems [that] will be operating in the geostationary orbit" (para. 130)); Public Notice, DARS System Applications Acceptable for Filing, 8 FCC Rcd 986 (1993) (announcing that five applications to construct, launch, and operate GSO DARS systems had been accepted for filing); Public Notice, DARS System Application Acceptable for Filing, 7 FCC Rcd 6763 (1992) (announcing that CD Radio's application to construct, launch, and operate a GSO DARS system had been accepted for filing).

^{4/} In particular, CD Radio stated in its comments that receiver interoperability was clearly in the interest of all DARS providers, as their availability would ensure the greatest possible deployed base of such equipment and thereby maximize the number of consumers who can receive DARS. CD Radio also argued that "[n]eedless to say, manufacturers will be reluctant to ramp up production on a matter with only a limited market that cannot meet economies of scale." Comments of CD Radio in IB Docket No. 95-91 at 92. See also Comments of AMRC in IB Docket No. 95-91 at 20; Comments of DSBC in IB Docket

(continued...)

and other interested parties have agreed that the two systems should deploy interoperable receivers. They have always agreed that such interoperability would (i) encourage manufacturers to begin early receiver production; (ii) create the economies of scale necessary to make DARS receiving equipment affordable; (iii) encourage consumer investment in satellite DARS equipment; (iv) promote competition in the marketing of receivers by reducing transaction costs; and (v) maximize consumer flexibility by enabling consumers to more easily switch between competing DARS providers.

As described above, XM Radio has invested substantial resources developing its DARS system, including its receivers. These investments have been premised at least in part on the belief that both CD Radio and XM Radio would be operating GSO DARS systems. After XM Radio was the high bidder in the DARS auction and turned its attention to finalizing the design of its system, it made receiver interoperability one of its highest priorities, initiating meetings with CD Radio and providing CD Radio with valuable technical analyses of the various options for system design. XM Radio undertook to engage CD Radio in a joint and comprehensive review process potentially leading to the kind of common signaling that would make interoperability highly practical. For six months beginning in mid-1997, XM Radio had its experts spend hundreds of hours exploring four different major technical options, including CDMA (which was the CD Radio modulation at the time), and presented their analysis to CD Radio. CD Radio indicated, however, that its satellite design could not be changed and that it would not use the TDMA

^{4/}(...continued)

No. 95-91 at 47-48; Comments of EIA in IB Docket No. 95-91 at 7-9; Comments of Ford in IB Docket No. 95-91 at 3-4; Joint Comments of DARS Applicants in IB Docket No. 95-91 at 3; Report and Order, Memorandum Opinion and Order, and FNPRM, Establishment of Rules and Policies for the Digital Audio Radio Satellite Service in the 2310-2360 MHz Frequency Band, 12 FCC Rcd 5754, ¶ 106 (1997).

technology XM Radio favors (and which CD Radio's current application proposes to use), so the licensees were unable to establish the kind of agreement that would make interoperable receivers most practical. Further discussions on interoperability occurred in the first months of 1998, in the context of work that XM Radio was doing to optimize the integration of terrestrial repeaters into its DARS system. Again, CD Radio, after reviewing XM Radio's analyses of the various options, indicated an unwillingness to change its design at that time.

XM Radio's interoperability discussions with CD Radio are consistent with published reports that CD Radio is at best indifferent to achieving compliance with the interoperability requirement. David Margolese, CD Radio's chairman, was recently quoted as saying that receiver interoperability is "not that relevant."^{5/} CD Radio apparently believes it has a disincentive to make interoperability possible, since it has always presented itself as having a headstart at being first-to-market.

Further evidence of CD Radio's unwillingness to cooperate in establishing interoperable receivers is provided by its recent lawsuit against XM Radio seeking an injunction against XM Radio's DARS system.^{6/} In contrast, XM Radio has been willing to contribute its technology towards the development of a common standard that will foster the development of interoperable receivers. This kind of cooperation is critical if receiver interoperability is to be achieved.

As described in the attached Technical Appendix, CD Radio's abrupt shift to an NGSO system design more than a year after receiving its DARS license will inhibit XM Radio from being able to deploy interoperable receivers even if the two companies were to agree on common

^{5/} Andrea Adelson, *Satellite Companies Bet on Demand for Digital Radio*, N.Y. Times, at C-6 (December 28, 1998).

^{6/} CD Radio Inc. v. XM Satellite Radio Inc., Case No. 99 Civ. 230 (S.D.N.Y. filed Jan. 12, 1999).

signaling. XM Radio intends to deploy several kinds of receivers with directional antennas that point at a single geostationary satellite. These include millions of low-cost receivers for the home market and portable boom-box-like receivers. The need to make these receivers interoperable with a nongeostationary satellite system will make them significantly more expensive. In some cases, receivers that consumers locate within line of sight of one or more of XM Radio's satellites will not be interoperable with CD Radio's proposed system because that line of sight will not be able to see the satellites continually as their orbital positions change.^{7/}

II. CD Radio's Proposed Modifications Will Increase Interference to Co-Channel Facilities in Central and South America

As discussed in the attached Technical Appendix, CD Radio's non-geostationary satellites, due to their transmission angles, will interfere with the use of their S-band frequencies in Central and South America for various wireless mobile and fixed operations that might be deployed in the future.

III. CD Radio Has Failed to Submit a Sufficient Filing Fee With its Application

CD Radio has failed to submit a sufficient filing fee with its application. CD Radio included a filing fee of \$22,010 with its modification application, the appropriate fee for an application to modify an already authorized NGSO system.^{8/} In the *CD Radio Authorization Order*, however, the FCC granted CD Radio authority to launch and operate a GSO DARS

^{7/} In *Geostar Positioning Corporation*, 6 FCC Rcd 2276 (1991), the Commission dismissed an application to modify a radiodetermination satellite service ("RDSS") system because the proposed modification was "so at variance" with the applicant's licensed system. The Commission later explained its holding in *Geostar* as follows: "The Commission regularly entertains requests for technical changes to satellites after a license has been granted . . . *Geostar's modification was dismissed because it was not consistent with the Commission's RDSS rules and policies.*" *Tentative Decision*, 6 FCC Rcd 4900, n. 114 (1991) (emphasis added).

^{8/} 47 C.F.R. § 1.1107.

system. Accordingly, CD Radio cannot possibly be applying for authority to modify an authorized NGSO system. Rather, CD Radio's modification application entails a request to launch and operate an NGSO system. Therefore, the most appropriate filing fee is \$308,105--the fee applicable for applications to launch and operate NGSO systems.

CD Radio's modification application requires the Commission to analyze many critical technical issues regarding an NGSO system which the Commission did not address when acting upon CD Radio's original application to launch and operate a GSO system. The Commission's application fee requirement is designed to cover the cost of these administrative processes.^{9/} The Commission cannot recover such costs if it treats CD Radio's application merely as a modification of an existing NGSO system rather than an application to launch and operate an NGSO system.

CD Radio itself has made a similar claim in opposing the application of WCS Radio to launch and operate a DARS system, arguing that WCS Radio's application should be dismissed for "its blatant disregard for the Congressionally mandated processing fee."^{10/} Like WCS Radio, CD Radio is attempting an end-around the Commission's filing fees. By applying first to launch and operate a GSO system and then characterizing its subsequent request to modify that system into a NGSO system as a modification on an existing NGSO system, CD Radio has avoided the substantial filing fee for applications to launch and operate NGSO systems.^{11/}

^{9/} See, e.g., 47 U.S.C. § 158(e); *Report and Order*, Establishment of a Fee Collection Program to Implement the Provisions of the Consolidated Omnibus Budget Reconciliation Act of 1985, 2 FCC Rcd 947, 948-49 (1987).

^{10/} Petition to Dismiss or Deny of Satellite CD Radio, Inc., File Nos. SAT-LOA-19981113-00085, SAT-LOA-19981113-00086 (Jan. 13, 1999).

^{11/} Pursuant to current regulations, the filing fee for an application to launch and operate a GEO system is \$89,460 per satellite, while an application to modify a GEO system is \$6,390. The filing fee for an application to launch and operate an NGSO system is \$308,105, while an application to modify an NGSO system is \$22,010. 47 C.F.R. §

(continued...)

Conclusion

Therefore, based on the foregoing, XM Satellite Radio Inc. urges the Commission to address these concerns.

Respectfully submitted,

XM SATELLITE RADIO INC.



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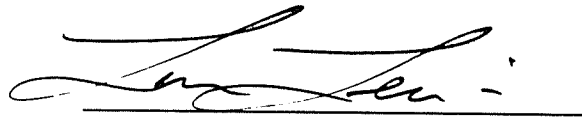
Lon C. Levin
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Date: February 8, 1999

Affidavit of Lon C. Levin

I, Lon C. Levin, hereby certify the following information under penalty of perjury:

I am currently Senior Vice President, Regulatory, of XM Satellite Radio Inc. ("XM Radio"). From January 1997 until June 1998, I was President of XM Radio (then called American Mobile Radio Corporation). During the period in which I was President, I was responsible for the development of XM Radio's satellite DARS system. I was directly involved in discussions within the company and with representatives of Satellite CD Radio, Inc. ("CD Radio") regarding the development of a receiver that would be interoperable with the DARS systems of XM Radio and CD Radio. I have reviewed the information contained in XM Radio's Comments on CD Radio's application regarding the development of receiver interoperability for these DARS systems, and the information contained in the Comments is true and correct to best of my belief.



Lon C. Levin

Dated: February 8, 1999

TECHNICAL ANALYSIS

The proposed CD Radio system has major flaws that will hamper or prevent receiver interoperability and result in increased interference to future terrestrial S-Band systems in Central and South America.

I. CD Radio's NGSO System Will Prevent or Hamper Receiver Interoperability

A. Receivers Using A Directional Antenna

XM Radio plans to deploy several receiver types that will have directional antennas, including specifically receivers for the home, portable receivers (such as "boom boxes"), and aeronautical receivers. These receivers will not need to look at two satellites at the same time, which permits them to be designed more simply and at lower cost.

CD Radio's proposed use of non-geostationary satellites will require all receivers to be capable of processing the signals from two or more satellites simultaneously, which substantially increases their complexity and cost. The electrical components of these multiple branch receivers will cost at least 40-50% more than those for a single branch receiver.

B. Fixed Site Receivers

It also will be impossible for many fixed-site receivers to be interoperable between the GSO and NGSO systems. At a fixed site, the user of a GSO DARS system needs only to establish line of sight to a single satellite, located (in the United States) to the south. For CD Radio's proposed system, however, users will need to locate their radios where they can find significant obstruction-free line-of-sight to gain access from the satellites over the entire sky-track of the satellites. In most areas of the country and during certain times of day, the only accessible satellite will be north of the user. Although CD Radio's application indicates that the fixed-receivers will have no diversity demodulator channels and that they will utilize external antennas

mounted on south facing walls,¹ this is obviously impossible.

II. CD Radio's NGSO System Will Cause Unacceptable Interference To Central and South America

CD Radio's proposed high inclination and highly elliptical orbit will result in spillover at very low angles of arrival into Central and South America. CD Radio shows transmit patterns at the node crossings (see CD Radio Application, Figure 10 and Figure 11), but most of the time the satellites will be operating at latitudes above the equator. CD Radio does not provide patterns for this normal operating condition. One such possible transmit pattern has been simulated by XM Radio and is shown in Figure 1. This simulation shows that the arriving flux density in South America would exceed the typical -152 dBW/m²/4 kHz limit by almost 20 dB. Moreover, the signals arrive in Central and South America at very low grazing angles. As a result, the CD Radio signal will cause interference to existing or planned terrestrial mobile or fixed wireless services in the following countries, listed below by region:

Central America: Belize, Guatemala, El Salvador, Honduras, Costa Rica, Panama

South America: Colombia, Venezuela, Ecuador, Peru, Brazil, Guyana, Suriname, Guiana, Bolivia

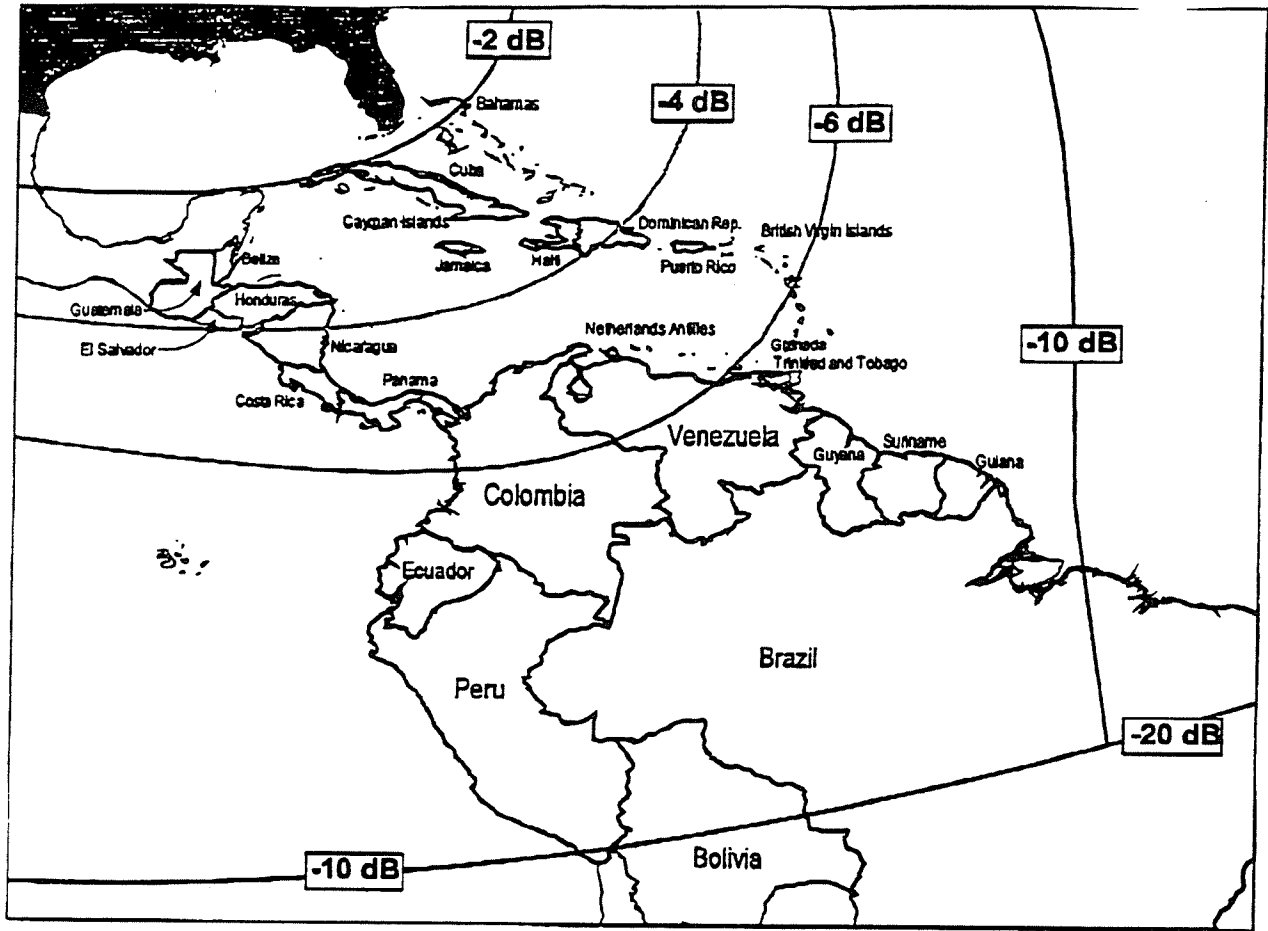
Caribbean Island Nations: Cuba, Trinidad & Tobago, Grenada, Netherlands Antilles, Haiti, Dominican Republic

As terrestrial and PCS spectrum gets congested in these countries, their ability to introduce digital voice and data services at S-band may be substantially reduced.

CD Radio's application has omitted important information that would permit the Commission and interested parties to better assess these interference concerns. In particular, CD Radio should be required to submit antenna patterns for a full range of typical angles of operation and to discuss how it plans to coordinate its NGSO system with administrations in Central and South America.

¹Application of Satellite CD Radio, Inc., File No. SAT-MOD-19981211-00099, at A-23.

FIGURE 1

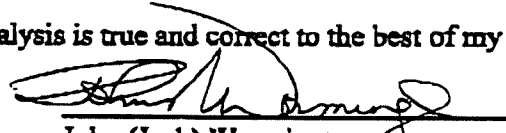


CD Radio Beam at Apogee
(parabolic rolloff, sized from pattern at ascending and descending nodes)

Technical Certification

I, John (Jack) Wormington, Senior Vice President, Engineering and Operations of XM Satellite Radio Inc. ("XM Radio"), hereby certify the following under penalty of perjury:

I am responsible for and have reviewed the foregoing Technical Analysis of XM Radio. The information contained in the Technical Analysis is true and correct to the best of my belief.


John (Jack) Wormington

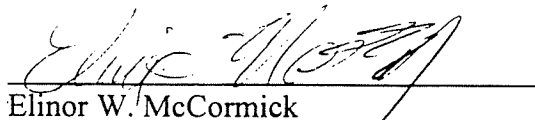
Dated: February 8, 1999

CERTIFICATE OF SERVICE

I, Elinor W. McCormick, a secretary to the law firm of Fisher Wayland Cooper Leader & Zaragoza L.L.P., hereby certify that on this 8th day of February 1999, served a true copy of the foregoing **"COMMENTS OF XM SATELLITE RADIO INC."** by first class United States Mail, postage prepaid, upon the following:

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