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Federal Communications Commission  
Washington, D.C. 20554

AUG - 7 1997

FEDERAL COMMUNICATIONS COMMISSION  
OFFICE OF THE SECRETARY

In the Matter of	)	IB Docket No. 95-91/
	)	GEN Docket No. 90-357
	)	
Establishment of Rules and Policies for the	)	RM No. 8610
Digital Audio Radio Satellite Service in the	)	PP-24
2310 - 2360 MHz Frequency Band	)	PP-86
	)	PP-87

**EX PARTE COMMENTS OF THE  
CONSUMER ELECTRONICS MANUFACTURERS ASSOCIATION**

The Consumer Electronics Manufacturers Association ("CEMA"), by its undersigned attorneys, hereby submits the following written *Ex Parte* Comments in the above-captioned proceeding ("Further Notice") in order to provide the Federal Communications Commission ("FCC" or "Commission") with additional information regarding the build-out of terrestrial DARS repeaters, as well as to respond to various engineering and technical concerns raised in the Reply Comments of the American Mobile Radio Corporation ("AMRC"), CD Radio and the National Association of Broadcasters ("NAB") (collectively "Respondents").<sup>1/</sup>

As the Commission and the parties to this proceeding are aware, CEMA strongly urges the FCC to adopt reasonable, yet necessary, requirements governing the build-out and performance of

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<sup>1/</sup> See Establishment of Rules and Policies for Digital Audio Radio Satellite Service in the 23120-2360 MHz Frequency Band, Report and Order, Memorandum Opinion and Order and Further Notice of Proposed Rulemaking, IB Docket No. 95-91, GEN Docket No. 90-357, RM No. 8610, PP-24, PP-86, PP-87 (rel. March 3, 1997) ("Further Notice").

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terrestrial DARS gap-fillers, particularly in urban environments.<sup>2/</sup> CEMA maintains that the propagation characteristics of DARS signals at S-band frequencies will require the licensees to deploy extensive networks of urban terrestrial transmitters in order to begin to approximate the signal quality and seamless coverage originally promised. In support of this position, CEMA cites its own field test data, as well as the independent research findings of the Communications Research Centre, Bureau for Radio Broadcast Technologies Research ("CRC Report").<sup>3/</sup> On June 27, 1997 the Respondents filed Reply comments raising questions regarding the validity and relevancy of CEMA's technical findings -- particularly those contained within the CRC Report. As discussed in greater detail below, CEMA responds to these concerns.

## DISCUSSION

In an effort to supplement the record in this proceeding and provide both the Commission and the licensees with a comprehensive and independent analysis of terrestrial DARS propagation characteristics, CEMA commissioned the CRC Report. The Report represents the most complete and comprehensive set of technical information received thus far in this proceeding on the subject of DARS gap-filler propagation. The CRC Report is significant in its finding that, if the promise of a seamless, ubiquitous, S-band DARS system is to be realized, a significant network of gap-fillers

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<sup>2/</sup> Comments of CEMA (filed June 13, 1997).

<sup>3/</sup> See Comments of CEMA. See also, *Ex Parte* filing entitled Report of the Field Test Task Group Field Test Data Presentation (filed January 30, 1997); Analysis of the Technical Merits of Terrestrial Gap-Fillers Supplementing DAR Satellite Broadcasting in the L-band and S-band Frequency Range, Communications Research Centre, at 29 (May 21, 1997), included as Exhibit 1 to CEMA's Comments ("CRC Report").

must be constructed. No doubt because of the costs associated with the build-out of such a network, the licensees object to the validity of the CRC Report and, ultimately, the imposition of any build-out or performance requirements.

In raising objections to the CRC Report, AMRC suggests that the findings are not relevant to it since the CRC Report evaluates on-channel terrestrial repeaters and AMRC will employ terrestrial gap-fillers on frequencies different from those utilized by the direct satellite.<sup>4/</sup> Although the limit on transmit power (discussed in the CRC Report at Section 5.2.1 and Table 5.2) will no longer be present with AMRC's proposed implementation, the CRC Report's findings are still valid in that AMRC's system will require multiple terrestrial re-transmitters, thereby encountering a significant multipath fading environment. AMRC will need to overcome this fading through the proper placement of multiple gap-fillers if seamless, CD-quality sound is to be provided.

The NAB challenges CEMA's conclusion that S-band satellite DARS system outages could be improved only marginally by higher elevation angles, higher power and/or diversity satellite transmitters. Not only does the NAB fail to provide proper support for its position, but it fails to acknowledge that conclusions similar to CEMA's are also found in NASA technical publications as well as other technical documentation.<sup>5/</sup>

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<sup>4/</sup> Reply Comments of AMRC at 9.

<sup>5/</sup> See J. Goldhirsh and W.J. Vogel, *Propagation Effects for Land Mobile Satellite Systems: Overview of Experimental and Modeling Results*, NASA Reference Publication 1274, February 1992 (cited by CRC Report as [GOL-92]). CD Radio states that the proposed spatial diversity of its transmit satellites will substantially reduce the need for gap-fillers. See Reply Comments of CD Radio at 9. CEMA notes, however, that CD Radio's proposed separation is 30° which, according to the referenced Reports, demonstrates only a marginal improvement in suburban and urban coverage.

The NAB also questions the applicability of the CRC Report's findings since neither satellite applicant currently proposes use of coded orthogonal frequency division multiplex modulation ("COFDM") used in the CRC Report as a basis for illustrative assessments. Indeed, the CRC Report clearly demonstrates that where terrestrial transmitters augment the satellite coverage, channel equalization is necessary to counter passive and active multipath.<sup>6/</sup> The use of COFDM as a basis for assessments does not affect this finding. To the extent that its performance is not equivalent, systems utilizing time domain equalization will not be able to utilize terrestrial repeaters at all. Presuming that time domain equalization can perform as well as guard intervals used in COFDM, the CRC Report and its findings are applicable.

Further, the NAB asserts that CEMA's Comments are inapt because "[s]pread spectrum systems such as the one CD Radio is proposing, are specifically excluded from the CRC analysis."<sup>7/</sup> CEMA disagrees. As an initial matter, spread spectrum systems also need channel equalization to operate in a frequency selective fading channel -- especially with the use of terrestrial repeaters. The CRC Report's discussion pertaining to single carrier modulation also applies to spread spectrum systems. Indeed, spread spectrum techniques orthogonalize a number of data channels on the same carrier frequency based on the use of orthogonal codes. To recover these different data channels, the channel distortion such as frequency selective fading must first be removed. As demonstrated in the CRC Report, channel equalization accomplishes this goal. Although CD Radio apparently assumes that Code Division Multiplex ("CDM") solves the propagation problems addressed in the

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<sup>6/</sup> See CRC Report, Sections 4 and 6.

<sup>7/</sup> Reply Comments of NAB at 5. See also, Reply Comments of CD Radio at 9.

CRC Report, such an assumption is erroneous. As supported by CEMA's comments, channel equalization will nevertheless be required for the terrestrial portion of CD Radio's system. Received signal levels will differ by 60-80 dB between satellite and terrestrial gap-filling transmitters, whereas achievable isolation from orthogonal codes is more likely in the 30-40 dB range. As such, it remains unclear whether the use of CDM will succeed with the implementation of terrestrial repeaters.

CD Radio objects to CEMA's claim that mobile reception, when restored by terrestrial gap-fillers, would fail at speeds above about 40 mph. CEMA stands by this statement. The velocity limit at S-band is a valid finding using the study's assumptions. The use of COFDM with properly-designed guard intervals, as shown in the CRC Report is appropriate to simulate a system which successfully provides seamless reception even when faced with difficult fading phenomena. The velocity limit is an inherent result of this design. Using S-band frequencies, with these assumptions, results in a substantial performance deficit, including velocity. CD Radio has provided no technical data to suggest that its system can effectively cope with multipath fading from terrestrial gap-fillers at *any* velocity.

Most preposterous, however, is CD Radio's claim that the CRC Report should be entirely disregarded because the CRC is affiliated with the Canadian government and therefore the technical data is somehow compromised. The CRC is both known and respected worldwide. The CRC conducted extensive technical assessments that were used by the FCC's U.S. Advisory Committee on Advanced Television Service. The CRC's involvement in the FCC's HDTV proceeding was widely accepted and relied upon -- not only because of the CRC's established expertise in the study area, but also because of its superior testing facilities. To suggest that the CRC would compromise

a worldwide reputation for engineering excellence to encourage the U.S. to reject its earlier decision to allocate S-Band DARS frequencies is not only farfetched and unsubstantiated, but apparently representative of the lengths to which CD Radio will go to detract the focus of the Commission's consideration from the valid technical concerns in CEMA's comments and the CRC Report.

### CONCLUSION

For the foregoing reasons, CEMA urges the Commission to carefully consider the technical data contained within the CRC Report and impose the performance and build-out requirements necessary to ensure that the promise of seamless, nationwide, CD-quality DARS is realized.

Respectfully submitted,

**The Consumers Electronics  
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Dated: August 7, 1997

**CERTIFICATE OF SERVICE**

I hereby certify that on this 7th day of August, 1997, copies of the foregoing Petition for Reconsideration of the Consumer Electronics Manufacturers Association were delivered via courier or sent First-Class Mail, U.S. postage prepaid, to the persons on the attached list.

A handwritten signature in cursive script, reading "Cathy Sampson", is written over a horizontal line. The signature is fluid and extends to the right with a long, sweeping tail.

Cathy Sampson

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