Before the
Federal Communications Commission
Washington, D.C. 20554

In the matter of	)	
	)	
Revision of Part 15 of the Commission's Rules	)	
Regarding Ultra-Wideband Transmission Systems	)	ET Docket No. 98-153
	)	

REPLY COMMENTS OF
XM RADIO INC. AND SIRIUS SATELLITE RADIO INC.

XM Radio Inc. ("XM Radio") and Sirius Satellite Radio Inc. ("Sirius") (collectively, the "Satellite Radio Licensees") hereby file these Reply Comments in the above-captioned proceeding in which the Commission is considering allowing ultra-wideband ("UWB") vehicular radar systems to operate in the 3.1- 10.6 GHz band. The Satellite Radio Licensees urge the Commission to refrain from allowing UWB vehicular radar systems to operate in the 3.1-10.6 GHz band until proponents of this technology provide information regarding the technical configuration of their systems and, in particular, how these systems will avoid interference to satellite radio. At a minimum, to the extent the Commission allows UWB vehicular radar systems to operate in the 3.1-10.6 GHz band despite the absence of any technical evidence in the record on the interference potential to satellite radio, then the Satellite Radio Licensees urge the Commission to provide potentially affected parties, including XM Radio and Sirius, ample notice and opportunity to object to any equipment certification application for these systems.

Background

Satellite Radio Licensees. In 1995, the Commission allocated spectrum in the S-band to the Satellite Digital Audio Radio Service ("SDARS" or "satellite radio"). XM Radio and Sirius were the winning bidders in the satellite radio auction held in April 1997, together committing

nearly $170 million to the U.S. Treasury.[1] XM Radio was awarded an SDARS license for the 2332.5-2345 MHz band and Sirius was awarded an SDARS license for the 2320-2332.5 MHz band. As the Commission has repeatedly recognized, this new consumer-based mass media service promises enormous public interest benefits for the U.S. public.[2] Since their licensing, XM Radio and Sirius have made extraordinary progress in the development of their satellite radio systems. Both licensees have successfully launched a total of five satellites, deployed in-band terrestrial repeaters in some markets to fill gaps in satellite coverage, and have initiated commercial service, providing high-quality, continuous, nationwide, digital, multichannel audio service.

Protection of Satellite Radio from Interference from Adjacent-Band Services. As the Satellite Radio Licensees have explained in a number of Commission proceedings, satellite radio is unique among services the Commission regulates because it is the only service that possesses four characteristics – satellite, mobile, mass media, and likelihood to be used in close proximity to potential sources of interference -- that make interference from unlicensed devices of greater potential and greater concern.[3] First, as a satellite service, satellite radio is necessarily more

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[1] *American Mobile Radio Corporation*, 13 FCC Rcd 8829 (Int'l Bur., 1997); *Satellite CD Radio*, 13 FCC Rcd 7971 (Int'l Bur., 1997).

[2] *See, e.g.*, *Establishment of Rules and Policies for the Digital Audio Radio Satellite Service in the 2310-2360 MHz Frequency Band*, *Report and Order, Memorandum Opinion and Order*, 12 FCC Rcd 5754, ¶ 1 (1997) ("*SDARS Order*").

[3] Sirius and XM Radio have discussed the susceptibility of satellite radio to interference from out-of-band emissions in the following proceedings: *Amendment of Part 18 of the Commission's Rules to Update Regulations for RF Lighting Devices*, *Notice of Proposed Rulemaking*, 13 FCC Rcd 11307, ET Docket 98-42 (1998) ("RF Lighting Proceeding"); *Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems*, *Notice of Proposed Rulemaking*, ET Docket 98-153 (May 11, 2000) ("UWB Proceeding"); *Review of Part 15 and Other Parts of the Commission's Rules*, *Notice of Proposed Rulemaking and Order*, ET Docket No. 01-278 (Oct. 15, 2001) ("Part 15 Review Proceeding"); *Amendments to Parts 1, 2, 27 and 90 of the Commission's Rules to License Services in the 216-220 MHz, 1390-1395*

vulnerable to interference than terrestrially based services, but no more vulnerable than other mobile satellite service systems in existence today.[4] Reception of satellite radio signals depends on the transmission of a signal from a satellite thousands of miles away to a very small aperture, low gain antenna.[5] While the SDARS satellites are state-of-the-art and among the most powerful communications satellites ever manufactured, the downlink signal power available to the receiver is much lower than terrestrial-based communications systems.[6] Like most satellite receivers, SDARS receivers operate near the noise floor, with a link margin just sufficient to protect against outages from blockage, multi-path fading, and foliage attenuation. As a result, satellite radio receivers are very sensitive to interference from nearby emissions into the SDARS band. Second, satellite radio is primarily a mobile service.[7] This eliminates the ability to enter into prior coordination agreements with sources of interference. Satellite radio receivers also use omnidirectional antennas that eliminate the ability to "point" an antenna away from a source of

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MHz, 1427-1429 MHz, 1429-1432 MHz, 1432-1435 MHz, 1670-1675 MHz, and 2385-2390 MHz Government Transfer Bands, WT Docket No. 02-08 (petitions for reconsideration pending).

[4]*See* Petition for Reconsideration of XM Radio Inc., WT Docket No. 02-8, at 2 (July 22, 2002); Joint Petition for Partial Reconsideration of XM Radio and Sirius, ET Docket No. 98-153, at 2 (June 17, 2002); Comments of XM Radio, ET Docket No. 01-278, at 3 and Exhibit A (Feb. 12, 2002); Comments of Sirius, ET Docket No. 01-278, Exhibit A at 20-26 (Feb. 12, 2002); Comments of XM Radio, ET Docket No. 98-153, at 3 (Sept. 12, 2000).

[5]Terrestrial repeaters do not solve the problem of interference to satellite radio from out-of-band emissions. The satellite radio licensees have deployed only a modest number of terrestrial repeaters to provide service in urban areas and elsewhere where the satellite signal is blocked by buildings and other obstacles. The satellite radio licensees provide service to subscribers directly with satellites in over 99% of the coverage areas.

[6]*See* Comments of XM Radio Inc., ET Docket No. 01-278, at Exhibit A; Letter from Sirius to Ms. Marlene H. Dortch, FCC, ET Docket No. 01-278 (April 19, 2002); Comments of Sirius Satellite Radio, ET Docket No. 01-278, Exhibit A at 20-26.

[7]*See* Petition for Reconsideration of XM Radio, Inc., WT Docket No. 02-08, at 2-3; Joint Petition for Partial Reconsideration of XM Radio and Sirius, ET Docket No. 98-153, at 2, 9-10; Reply Comments of XM Radio, ET Docket No. 01-278, at 8 (March 12, 2002); Comments of XM Radio, ET Docket No. 01-278, at 3, 18; Comments of Sirius, ET Docket No. 01-278, Exhibit A, at 20.

interference.[8] Third, satellite radio providers must achieve 99.9% availability to satisfy consumer expectations for quality of service.[9] Even intermittent interference is unacceptable for consumers who are paying for high-quality, digital audio entertainment. Fourth, satellite radio receivers are likely to be used in close physical proximity to the very devices that are the most likely sources of interference. When used in a car, satellite radio receivers will come close to Bluetooth-enabled cell phones, family radios, 2.4 GHz WiFi internet access points, and UWB hand-held devices and surveillance systems, among others.

In adopting out-of-band emission limits for Wireless Communications Service ("WCS") licensees, which operate in the 2305-2320 MHz and 2345-2360 MHz bands adjacent to satellite radio, the Commission accounted for these unique features of satellite radio. The Commission concluded that "[i]n authorizing DARS, it was our desire to ensure a high quality radio service" and that if satellite radio "is subject to excessive interference, the service will not be successful and the American public will not benefit from the service."[10] The Commission's rules limit the emissions from WCS mobile devices into the SDARS band to -80 dBm. *See* 47 C.F.R. §27.53(a)(2).[11] The Commission has also negotiated for similar limits in international coordination agreements.[12]

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[8]*See* Petition for Reconsideration of XM Radio, Inc., WT Docket No. 02-08, at 3; Joint Petition for Partial Reconsideration of XM Radio and Sirius, ET Docket No. 98-153, at 2; Reply Comments of XM Radio, ET Docket No. 01-278, at 8; Comments of XM Radio, ET Docket No. 01-278, at 18; Comments of XM Radio, ET Docket No. 98-153, at 3.

[9]*See* Petition for Reconsideration of XM Radio, Inc., WT Docket No. 02-08, at 3; Comments of XM Radio, ET Docket No. 01-278, at 3, 18; *see also* Joint Petition for Partial Reconsideration of XM Radio and Sirius, ET Docket No. 98-153, at 20-21.

[10]*Amendment of the Commission's Rules to Establish Part 27, the Wireless Communications Service*, *Memorandum Opinion and Order*, 12 FCC Rcd 3977, ¶¶ 25, 27 (1997) ("*WCS Order*").

[11]The rule requires the power of any emission into the SDARS band from a mobile and most portable WCS transmitters to be attenuated below the transmitter power (p) by a factor of

UWB Vehicular Radar. In February 2002, the Commission adopted an *Order* amending its rules to allow for the operation of unlicensed UWB devices.[13] The Commission divided UWB devices into three categories based on their potential to cause interference: (1) imaging systems, including surveillance systems; (2) communications devices; and (3) vehicular radar systems. With respect to UWB vehicular radar, the Commission adopted a number of operating and technical restrictions, including the following[14]: (i) the -10 dB bandwidth must be within the 22-29 GHz band; (ii) the center frequency of the emission and the frequency at which the highest radiated emission occurs must be greater than 24.075 GHz; and (iii) radiated emissions shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Frequency in MHz	EIRP in dBm
960-1610	-75.3
1610-22,000	-61.3
22,000-29,000	-41.3
29,000-31,000	-51.3
Above 31,000	-61.3.

In adopting these emission limits, the Commission noted that although vehicular radar systems are likely to be located in close physical proximity to satellite radio receivers, they are unlikely to cause interference to satellite radio because they "are being required to operate in a considerably higher frequency band than that used by DARS." *UWB Order* ¶ 169. The Satellite

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110 + 10 log (p) dB. Assuming a 1 Watt WCS mobile transmitter, this equates to a signal level of -80 dBm at the source (5.8 μV/m at 3 meters).

[12]The limit for new Canadian fixed systems into the SDARS band is -155 dBW/m^2/4kHz, which is equivalent to 5.5 μV/m. *See United States and Canada Agree on Conditions for Implementation of U.S. Satellite Digital Audio Radio Services (DARS) and Canadian Terrestrial Digital Radio Broadcast Services (T-DRB) along the U.S./Canada Border Area*, Report No. IN 98-50, *News Release* (Sept. 3, 1998) at 4 ("Canadian Coordination Agreement").

[13]*Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems, First Report and Order*, 17 FCC Rcd 7435 (adopted Feb. 14, 2002) ("*UWB Order*").

[14]47 C.F.R. § 15.515.

Radio Licensees agreed with this conclusion.[15] In March 2003, the Commission released a *Memorandum Opinion and Order ("MO&O")* acting on Petitions for Reconsideration of its decision to authorize UWB devices.[16] In the *MO&O*, the Commission again noted that vehicular radars are unlikely to interfere with satellite radio because they are restricted to operating above 22 GHz. *UWB MO&O* ¶ 119.

In March 2003, the Commission released a *Further Notice of Proposed Rulemaking* ("*FNPRM*") proposing to amend its rules to permit the operation of any UWB product, including vehicular radar, under the rules pertaining to UWB hand-held devices.[17] These rules restrict the -10 dB bandwidth of the UWB device to the 3.1-10.6 GHz band and restrict emissions in the 1.9-3.1 GHz band to -61.3 dBm. 47 C.F.R. § 15.519. Three parties filed Comments in support of the Commission's proposal to allow UWB vehicular radar to operate in the 3.1-10.6 GHz band.[18]

Discussion

The Commission has acknowledged that of all UWB devices, UWB vehicular radar systems have the greatest potential to be located in close physical proximity to and thus cause interference to satellite radios located in vehicles. *UWB Order* ¶ 169. Because UWB vehicular

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[15] *See* Joint Petition for Partial Reconsideration of XM Radio and Sirius, ET Docket No. 98-153 (June 17, 2002), at 16 n.44 ("Vehicular radar's operating band is so far from the SDARS band that there is little possibility of harmful interference from these devices into satellite radio receivers, despite their physical proximity."); *id.* at 17 ("Because of the widely separated operating frequencies, vehicular radar is highly unlikely to cause interference to satellite radio.").

[16] *Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems, Memorandum Opinion and Order and Further Notice of Proposed Rulemaking*, ET Docket No. 98-153, FCC 03-33 (released March 12, 2003) ("*UWB MO&O*").

[17] *Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems, Memorandum Opinion and Order and Further Notice of Proposed Rulemaking*, ET Docket No. 98-153, FCC 03-33 (released March 12, 2003) ("*UWB NPRM*").

[18] *See* Comments of Delphi Automotive Systems Corporation, ET Docket No. 98-153 (July 18, 2003); Comments of Multispectral Solutions, Inc., ET Docket No. 98-153 (July 21, 2003); Comments of Short Range Automotive Radar Frequency Allocation Group, ET Docket No. 98-153 (July 21, 2003).

radar systems are currently restricted to the 22-29 GHz band, however, the Commission and the Satellite Radio Licensees have assumed that these systems would not present an interference concern to satellite radio. Now that the Commission is proposing to allow UWB vehicular radar systems to operate in the 3.1-10.6 GHz band, this assumption is no longer valid.

In the *UWB FNPRM*, the Commission specifically requested that commenters provide technical analyses supporting their proposals.[19] In their Comments, however, proponents of UWB vehicular radar systems in the 3.1-10.6 GHz band have not provided any technical showing as to how their systems will be configured. In particular, the proponents have not provided any analyses as to how their radar systems might impact satellite radio reception. While vehicle manufacturers will likely engineer radar systems to avoid interference to satellite radio operating within the same vehicle, this does not address a situation in which a radar system in one car is directly pointed at a trunk- or roof-mounted satellite radio antenna in an adjacent vehicle. For example, if vehicular radar transmit antennas are located in close physical proximity to[20] and in direct line of sight of satellite radio antennas, interference to satellite radio reception will result even though the Commission proposes to limit emissions in the SDARS band to a level of -61.3 dBm. As this point, there is no evidence in the record of this proceeding on which the Commission can conclude that vehicular radar systems operating in the 3.1-10.6 GHz band will not cause interference to satellite radio reception. For these reasons, before allowing UWB vehicular radar systems to operate in the 3.1-10.6 GHz band, the Satellite Radio Licensees urge the Commission to require proponents of this technology to provide information

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[19] *FNPRM* ¶ 155 ("Specific technical analyses supporting the comments are requested").

[20] The Commission has calculated that a hand-held UWB device operating between 3.1 and 10.6 GHz with an emission level of -61.3 dBm in the SDARS band would need to be located 3.8 meters from a satellite radio antenna to avoid interference. *UWB MO&O* ¶ 119.

regarding the configuration of their systems and, in particular, how these systems will avoid interference to satellite radio reception.

At a minimum, to the extent the Commission allows UWB vehicular radar systems to operate in the 3.1-10.6 GHz band despite the absence of any technical evidence in the record on the impact on satellite radio, then the Satellite Radio Licensees urge the Commission to provide potentially affected parties, including XM Radio and Sirius, ample notice and opportunity to object to any equipment certification application for these systems.

Conclusion

XM Radio and Sirius urge the Commission to act consistently with the views expressed herein.

Respectfully submitted,

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August 20, 2003