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

In the Matter of:	)	
	)	
Amendment of Part 27 of the	)	WT Docket No. 07-293
Commission's Rules to Govern the	)	
Operation of Wireless Communications	)	
Services in the 2.3 GHz Band	)	
	)	
Establishment of Rules and Policies for the	)	IB Docket No. 95-91
Digital Audio Radio Satellite Service in the	)	GEN Docket No. 90-357
2310-2360 MHz Frequency Band	)	RM No. 8610

PETITION FOR PARTIAL RECONSIDERATION AND CLARIFICATION OF SIRIUS XM RADIO INC.

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Sirius XM Radio Inc. ("Sirius XM"), pursuant to Section 1.429 of the Commission's Rules,[1] hereby petitions for reconsideration and clarification of the May 20, 2010 *Order* in the above-captioned proceedings.[2] The *Order* reversed long-standing protections that the Commission found necessary to prevent interference to satellite radio consumers by allowing, for the first time, mobile operations in the 2.3 GHz Wireless Communications Service. As detailed below, the FCC must revise its new rules in order to adequately protect satellite radio's nearly 35 million existing listeners.

I. INTRODUCTION AND SUMMARY

Partial reconsideration is necessary because portions of the *Order* were based on mistakes of fact and law such that the *Order* fundamentally failed to accomplish the stated purpose of the

[1] 47 C.F.R. § 1.429.

[2] *See* Amendment of Part 27 of the Commission's Rules to Govern the Operation of Wireless Communications Services in the 2.3 GHz Band, WT Docket No. 07-293, *Report and Order*, Establishment of Rules and Policies for the Digital Audio Radio Satellite Service in the 2310-2360 MHz Frequency Band, IB Docket No. 95-91, *Second Report and Order*, FCC 10-82

proceeding: "to craft WCS service rules that will allow WCS to co-exist with" satellite radio without that service's consumers' "experiencing harmful interference."[3] In order to satisfy that goal, the Commission must reconsider several WCS technical service rules and clarify key aspects of the WCS and satellite radio notification and coordination requirements.

In adopting the new WCS technical rules, the FCC appears to have ignored or misapplied reliable test data, choosing instead to establish standards unsupported by the evidence. Despite voluminous data in the record demonstrating the significant harm that mobile WCS broadband service could cause to consumers' satellite radio reception, the *Order* adopted rules that are inadequate and without basis in at least the following respects:

- No record data justify allowing WCS fixed customer premises equipment ("CPE") to operate in the 2.5 MHz of spectrum immediately adjacent to the satellite radio allocation, which the Commission established as a guard band where WCS mobile and portable devices may not operate. No such operations were even tested prior to the release of the *Order*.
- No data support allowing fixed CPE devices with up to 20 watts per 5 MHz peak equivalent isotropically radiated power ("EIRP") or applying the WCS mobile and portable device out-of-band emissions ("OOBE") mask to fixed CPE devices operating at up to 2 watts per 5 MHz average EIRP. This is 9 dB more than the power limits established for WCS mobile and portable devices operating in the A and B Blocks and 12 dB more than the power limits established for WCS mobile and portable devices in the C and D blocks.
- In setting OOBE limits for WCS transmitters, the FCC ignored, discounted, or misconstrued technical data submitted by Sirius XM demonstrating a high potential for interference even when the victim receiver and the interfering transmitter are separated by significant distances. At minimum, the Commission should have adopted more stringent OOBE limits for mobile and portable WCS devices to minimize the potential and extent of interference.
- The 38% duty cycle limitation that the Commission applied to WCS Time Division Duplex ("TDD") mobile and portable devices is unsupported by any technical data on the record.

(rel. May 20, 2010) ("*Order*"). The Order was published in the Federal Register on Monday, August 2, 2010. *See* 75 Fed. Reg. 45058 (Aug. 2, 2010).

[3] *Order* at 14, ¶ 28.

- The Commission also ignored substantial technical data recently submitted by Sirius XM, based in part on real-world observations of an operational 2.5 GHz WiMAX system, demonstrating the potential of fixed base stations to create overload interference.

The coordination and notification standards in the rules are too vague and uncertain to be effective. As one example, the *Order* appropriately recognized a duty to cooperate on behalf of WCS and satellite radio licensees in locating their fixed facilities but failed to adequately define what that actually means in practice. In order to effectively minimize the possibility of harmful interference, the FCC must specify the duties and obligations of the parties to coordinate and cooperate. Clearly identified, objective interference criteria would facilitate the parties' efforts to work together smoothly and avoid disputes.

Finally, although the *Order*'s satellite radio terrestrial repeater rules are generally appropriate for their intended purpose, minor modification and clarification are necessary. For example, the Commission's definition of which WCS licensees are "affected" by the continued operation of legacy, high-powered terrestrial repeaters operating above 12 kW is overbroad and relies on a flawed public interest analysis. Also, the conditions under which Sirius XM must notify WCS licensees about the location and operation of very low power repeaters—which the FCC has previously said pose little interference risk and which were never raised as an issue of concern by the WCS Coalition—should be clarified.

Sirius XM recommends the Commission correct these deficiencies in the following manner:

- Revise Section 27.50 as it pertains to WCS fixed CPE to: 1) apply a 2.5 MHz guard band to the satellite radio allocation, 2) apply a 250 mW maximum transmitter power limit to any fixed CPE devices taking advantage of the relaxed OOBE mask originally developed for WCS mobile devices, and 3) clarify that fixed CPE are subject to a peak EIRP of 20 watts within any 5 MHz of authorized bandwidth with a maximum of 400 mW within any one megahertz;

- Modify Section 27.53 to adopt a more stringent 70 + 10 log (P) dB OOBE attenuation factor for WCS mobile, portable, and fixed CPE devices to protect satellite radio consumers from proven interference;
- Modify Section 27.50 to reduce the maximum duty cycle limit for WCS mobile and fixed CPE devices to at least 35 percent, measured according to a 5 millisecond repetition rate, and restrict uplink transmissions to every other frame;
- Adopt a ground level emissions limit to protect satellite radio receivers from overload interference caused by WCS base stations;
- Clarify the Commission's expectations about the distance at which a satellite radio consumer is expected to tolerate muting by WCS transmitters, as expressed in footnote 315 of the *Order*;
- Clarify the WCS and satellite radio licensees' duties to cooperate with respect to base station and terrestrial repeater placement and operations by modifying Section 27.72(e) to require specific information be shared through a clearinghouse and establish objective criteria to facilitate interference avoidance and mitigation;
- Under Section 25.214 of the Rules, , replace the overly broad "REAG" and "MSA" based definition of "potentially affected" WCS licensees with a more narrowly tailored coordination distance of 5km; and
- Clarify that Sirius XM's very low power terrestrial repeaters are not subject to the same inventory and notification requirements applicable to the rest of the terrestrial repeater network.

In short, the Commission has adopted technical and operational service rules that elevate the WCS licensees' commercial convenience above the rights of satellite radio consumers to enjoy interference-free service. The *Order* repeatedly settled disputes based not on the technical evidence in the record, but instead on WCS licensees' assertions about what technologies are most cheaply and readily available. In light of this failure to properly balance the public interest considerations and to protect the interests of millions of satellite radio listeners, the FCC should reconsider the rules adopted in the *Order* as detailed herein.

II. THE COMMISSION SHOULD RECONSIDER ITS TECHNICAL STANDARDS FOR FIXED, MOBILE, AND PORTABLE WCS SUBSCRIBER DEVICES.

The *Order* failed to satisfy even its most fundamental goal, namely to enable the deployment of widespread mobile broadband services while protecting satellite radio listeners

from "experiencing harmful interference."[4] Because the Commission based its technical rules for WCS subscriber devices on faulty engineering, flawed assumptions, and insufficient data that will subject tens of millions of satellite radio listeners to increased levels of potential interference, reconsideration is appropriate. Despite wildly conflicting data submitted by the parties in this proceeding, the Commission did not conduct or authorize any independent tests that might definitively establish the interference risks between the two services, even though an analogous wireless network operates at 2.5 GHz in close proximity to Washington, D.C. This deficiency casts a shadow of doubt over the Commission's entire technical analysis. The revisions proposed by Sirius XM strike a proper balance, protecting satellite radio's tens of millions listeners while having minimal impact on the prospects for widespread deployment of mobile broadband services over the WCS spectrum.

A. The Commission Should Reconsider the Fixed CPE Technical Specifications.

The *Order* established rules for two new fixed CPE classes of user devices that are essentially devoid of evidentiary support. The *Order* authorized the operation of fixed CPE at power levels up to 20 W per 5 MHz peak EIRP subject to OOBE attenuation by a factor of 75 + 10 Log (P) dB on all frequencies between 2320 and 2345 MHz.[5] The *Order* also adopted separate rules for fixed CPE transmitting with 2 W per 5 MHz average EIRP or less, for which OOBE into the satellite radio band are subject to the same stepped emission mask as mobile and portable user devices.[6] In both cases—and unlike the rules applicable to WCS mobile and portable devices—the Commission allowed fixed CPE devices to operate throughout the WCS allocation without providing any guard band to protect the satellite radio service.

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4 *Order* at 14, ¶ 28.

5 *Id.* at 59, ¶ 140.

6 *Id.* at 60, ¶ 142.

No reliable record evidence supports the Commission's decisions with respect to fixed CPE. The *Order* alternates between analogizing to fixed stations and mobile stations in crafting fixed CPE rules, with the resulting rules applying the reduced mobile device OOBE limits to devices operating at several times more power with no guard band to protect satellite radio consumers. The only evidence the FCC pointed to as justifying its decision to authorize fixed CPE of up to 20 W per 5 MHz peak EIRP is the fact that such equipment is listed in the FCC's Equipment Authorization Database.[7] But a database registration hardly demonstrates that these devices can coexist with satellite radios without causing harmful interference. And nothing in the record shows how many of these authorized devices are actually in use or on which WCS frequency blocks they operate. Indeed, AT&T has acknowledged deploying fixed CPE home broadband using the WCS spectrum, however Sirius XM understands that AT&T has done so using only the A and B blocks. No evidence suggests that any party has actually deployed wireless broadband services in the WCS C or D blocks closest to the satellite radio band. Moreover, existing devices would have been authorized pursuant to the current 80 + 10 log (P) OOBE attenuation factor applicable to WCS fixed stations, a level providing greater interference protection to satellite radio listeners than that provided by the new rules.[8]

The only concrete technical data in the record relating to fixed CPE demand a conclusion exactly the opposite of the Commission's. Sirius XM filed extensive field test results demonstrating that fixed WCS transmitters operating on the lower WCS B Block at 2 W with greater OOBE attenuation and a lesser duty cycle than that authorized by the *Order* would likely

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7 *Id.* at 59, ¶ 141.

8 *See* 47 C.F.R § 27.53(a)(1).

mute satellite radio reception at a distance of 51 meters.[9] Adopting rules loosening the technical restrictions on fixed CPE based on this record was in error and should be reconsidered.

The record in this proceeding supports the need for a guard band to protect satellite radio consumers from harmful interference and a guard band is no less needed for fixed devices than for mobile devices. As the *Order* recognized, the technical demonstrations conducted at Ashburn, Virginia in July 2009 proved precisely this need.[10] Yet, the Commission ignored the observations of its technical staff at Ashburn when it claimed that the "increased propagation losses associated with the increased distances between WCS CPE and [satellite radio] receivers and structural blockages will be sufficient to limit the potential for harmful interference from WCS CPE" such that no guard band in the WCS C and D blocks would be necessary.[11] This claim is unsupported by any record evidence. No data has been presented assessing how much physical separation can be expected between fixed CPE devices and satellite radio receivers; nor does any data detail the amount of attenuation that can be expected from signals emanating from fixed CPE located indoors. The only record evidence shows that attenuation caused by indoor transmitter placement varies greatly depending on the location of the antenna and structural characteristics of the building.[12]

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9 *See* Comments of Sirius XM Radio Inc., WT Docket No. 07-293, IB Docket No. 95-91, GEN Docket No. 90-357, RM No. 8610, Technical Appendix at 7 (test case 15) (filed April 23, 2010) ("Sirius XM April 23, 2010 Comments").

10 *See Order* at 31-32, ¶ 67 (noting that based on the observations at the Ashburn tests and to "limit the potential for harmful interference to SDARS receivers, we are prohibiting WCS mobile and portable devices from operating in the 2.5-megahertz portions of WCS Blocks C and D closest to the SDARS band.").

11 *Id.* at 60, ¶ 143.

12 *See* J. B. Andersen, T. S. Rappaport, S. Yoshida, *Propagation Measurements and Models for Wireless Communications Channels*, IEEE Communications Magazine, Jan. 1995, at 46-49 (describing variables related to indoor RF propagation).

Moreover, although the new rules prohibit outdoor CPE deployments, the Commission offered no concrete advice on how this proscription will ever be enforced at the consumer level. Any potential protection due to physical separation and structural blockage may therefore turn out to be illusory.[13] For these reasons, the FCC should modify its fixed CPE rules to provide that fixed CPE may not operate in the 2.5 MHz of the C and D blocks closest to the satellite radio band.

The Commission also cannot justify applying the same stepped OOBE mask to fixed CPE devices operating with up to 2 W per 5 MHz average EIRP as it applies to 250 mW mobile and portable devices.[14] The *Order* cited to Sirius' and XM's comments in support of treating lower-powered CPE differently from other CPE, yet those comments were clearly based on a 75 + 10 log (P) OOBE limitation rather than the less restrictive OOBE limit that the agency ultimately adopted.[15] Again, the Commission cited no evidence for the proposition that this stepped OOBE mask will be sufficient to protect satellite radio consumers from harmful interference caused by CPE devices operating at a substantially higher power than mobile and portable transmitters. The record also contains no "link budget" analysis showing that such devices will provide adequate protection to satellite radio receivers. Although Sirius XM takes

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[13] For example, although the new rules prohibit the installation of outdoor antennas with certain fixed CPE devices, they do not require that antennas be integral to the device. If the Commission allows fixed CPE devices with connections for external antennas, consumers are likely to install antennas in a manner that maximizes reception, whether indoors or outdoors. At least one WCS licensee has indicated that it intends to seek reconsideration of this condition. *See* Petition of AT&T, WT Docket No. 07-293, IB Docket No. 95-91, GEN Docket No. 90-357, RM-8610 at 2 (filed Aug. 2, 2010) ("AT&T Petition") ("AT&T intends to file a petition for reconsideration in this proceeding that will ask the Commission to modify the new prohibition on the use of outdoor antennas for fixed CPE stations or outdoor CPE station installations and allow their use provided they comply with the current OOBE antenna requirements.").

[14] *See id.* at 60, ¶ 142.

[15] Comments of Sirius Satellite Radio Inc., WT Docket No. 07-293 at 31-32 (filed Feb. 14, 2008); Comments of XM Radio Inc., WT Docket No. 07-293 at 35 (filed Feb. 14, 2008).

issue with the stepped OOBE mask applied to mobiles,[16] even were the FCC to retain that mask, it should not apply the same mask to fixed CPE that are 9 dB more powerful. Unlike with respect to mobile devices, no question has been raised as to the viability of deploying fixed CPE that conform with the previous OOBE limits. Indeed, AT&T and others reportedly provide WCS home broadband services using fixed CPE while meeting the existing OOBE limits.[17] Since no evidence supports a different approach, if the Commission treats fixed CPE like mobile devices with respect to OOBE, it should do so consistently and apply the mobile transmitter power limit of 250 mW to fixed CPE.

On a related matter, the Commission issued an Erratum correcting the Order to specify all WCS power limits as power densities, amending Section 27.50(a)(2) of the Rules to provide that for fixed CPE stations "transmitting in the 2305-2320 MHz band or in the 2345-2360 MHz band, the peak EIRP must not exceed 20 watts per 5-megahertz."[18] Because the rule expresses the power limit as a ratio, it could be read to allow licensees aggregating adjacent WCS spectrum blocks to deploy transmitters with a total peak EIRP of 40 or even 60 watts. The Commission's prior rules allowed no such flexibility, and the potential impact of such a change was not seriously analyzed during the course of this proceeding.[19] By comparison, the revised rules for

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16 *See* Section II.B. *infra.*

17 *See* AT&T Petition at 2-3 (discussing use of fixed CPE to provide residential broadband service under the existing rules).

18 *See* Amendment of Part 27 of the Commission's Rules to Govern the Operation of Wireless Communications Services in the 2.3 GHz Band, WT Docket No. 07-293, *Report and Order*, Establishment of Rules and Policies for the Digital Audio Radio Satellite Service in the 2310-2360 MHz Frequency Band, IB Docket No. 95-91, *Second Erratum*, (rel. July 14, 2010).

19 Sirius XM previously discussed this issue with the FCC staff who, at the time, explained that concerns about spectrum aggregation would be obviated by applying varying duty cycle limits on the different WCS spectrum blocks. *See* Ex Parte Letter from Michael A. Lewis, Engineering Consultant, Wiley Rein LLP, to Marlene H. Dortch, Secretary, Federal Communications Commission at 2, WT Docket No. 07-293, IB Docket No. 95- 91 (filed April 5,

base and fixed stations and mobile and portable stations make clear that no increase in power due to spectrum aggregation is permitted. For example, Section 27.50(a)(1) of the Rules states that the maximum average EIRP for base and fixed stations "must not exceed 2,000 watts within any 5 megahertz of authorized bandwidth and must not exceed 400 watts within any 1 megahertz of authorized bandwidth."[20] To remove confusion and prevent unintended consequences, the Commission should revise its newly adopted fixed CPE rules to specify a peak EIRP of 20 watts within any 5 megahertz of authorized bandwidth.

B. The Commission Should Adopt A More Stringent 70 + 10 log (P) dB OOBE Attenuation Factor For Mobile and Portable WCS Devices Into the 2320-2345 MHz Band.

In relaxing the OOBE limits for mobile and portable WCS device emissions into the satellite radio band,[21] the FCC placed more significance on WCS licensees' commercial convenience than on technical analyses demonstrating the high likelihood of harmful interference under the adopted scenario. The Commission candidly admitted that the OOBE limits it adopted were the precise limits proposed by the WCS Coalition and that it adopted these limits based only "on their feasibility and the potential economic viability they offer" to WCS licensees. Indeed, the FCC even noted the WCS Coalition's admission that the OOBE limits do not "foreclose the possibility of potential interference from WCS" to satellite radio consumers.[22]

2010). However, the *Order* abandoned that approach in favor of more consistent duty cycle requirements across the WCS allocation.

[20] *See Order* at Appendix B, Section 27.50(a)(1).

[21] The *Order* applies a stepped OOBE mask to WCS mobile and portable operations by requiring that such emissions be attenuated by a factor of not less than 55 + 10 log (P) dB in the 2320-2324/2341-2345 MHz bands, not less than 61 + 10 log (P) dB in the 2324-2328/2337-2341 MHz bands, and not less than 67 + 10 log (P) dB in the 2328-2337 MHz band, as measured over a 1 MHz bandwidth. *Id.*

[22] *Id.* at 38, ¶ 85 (citing Comments of the WCS Coalition, WT Docket No. 07-293 at 3, 4-7, 11 (filed Feb. 14, 2008) ("WCS Coalition 2008 Comments")).

Sirius XM has submitted extensive technical analysis demonstrating precisely what the WCS Coalition concedes, *i.e.*, these OOBE limits will cause harmful interference to satellite radio consumers even when the victim receiver and the interfering WCS device are separated by significant distances.[23] For example, at the Ashburn demonstrations, which were conducted in an area of the country having the strongest available satellite radio reception, Sirius XM demonstrated that under real-world conditions, a 250 mW WiMAX signal transmitted over the WCS spectrum with the proposed OOBE mask will cause harmful interference to satellite radio consumers at physical separation distances greater than 25 meters.[24] Even during the WCS Coalition's Ashburn demonstration, which was a "best-case" scenario involving only one WCS mobile transmitter, the OOBE mask adopted by the *Order* caused muting to a satellite radio receiver. The *Order* ignored the only reasonable conclusion to be drawn from the available evidence, namely that the OOBE limits proposed by the WCS Coalition and now adopted by the Commission will be insufficient to protect tens of millions of satellite radio listeners.

The *Order's* failure to rely on sound evidence proving the insufficiency of the WCS Coalition's proposed OOBE mask requires the Commission to revise the new WCS OOBE limits to better serve the dual purposes of enabling mobile broadband deployment in the 2.3 GHz band

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[23] *See, e.g.*, Letter from Terrence R. Smith and James S. Blitz, Sirius XM Radio Inc., to Marlene H. Dortch, Federal Communications Commission, WT Docket No. 07-293 (filed Feb. 27, 2009) (submitting into record technical reports by Southwest Research Institute and Motorola, Inc.); Letter from Terrence R. Smith and James S. Blitz, Sirius XM Radio Inc., to Marlene H. Dortch, Federal Communications Commission, WT Docket No. 07-293 (filed Aug. 3, 2009) (providing analysis of technical demonstrations at Ashburn, VA) ("Sirius XM Ashburn ex parte"); Sirius XM April 23, 2010 Comments, Technical Appendix; Supplemental Comments of Sirius XM Radio Inc., WT Docket No. 07-293 (filed April 29, 2010) (submitting into record "Technical Analysis of the Impact of Adjacent Service Interference to the Sirius XM Satellite Digital Audio Radio Services (SDARS)" by Theodore S. Rappaport, P.E., TELISITE Corp. ("Rappaport Study")).

[24] *See* Sirius XM Ashburn ex parte at 4. The test conditions included a 25 percent duty cycle and a 5 millisecond repetition rate.

and protecting satellite radio consumers. Sirius XM previously endorsed an OOBE attenuation factor of 70 + 10 log (P) dB, which would represent a substantial loosening of the 110 + 10 log (P) dB attenuation factor that the Commission initially believed was essential to protect satellite radio operations from WCS interference.[25] Sirius XM also filed a scientifically rigorous and transparent engineering analysis of the potential for mobile-to-mobile interference from WCS devices to satellite radio receivers conducted by Dr. Theodore S. Rappaport, P.E.[26] Although Dr. Rappaport ultimately recommended even more stringent protection for satellite radio receivers, his study concluded that "in all cases, at least a 70 dB mask was required" and "[i]n no cases did the FCC Staff proposed spectral mask provide reasonable protection to the [satellite radio] service."[27] The Commission wholly disregarded Dr. Rappaport's study in reaching its conclusions.

Contrary to the WCS Coalition's claim that no filters capable of achieving 70 + 10 log (P) dB attenuation are currently commercially available, Sirius XM filed a preliminary analysis of the feasibility of designing such a filter, conducted by component manufacturer TDK-EPCOS.[28] The TDK-EPCOS analysis revealed the feasibility of developing such a filter at a potential cost below $1 per filter, which would not threaten the commercial viability of WCS mobile broadband service.[29] The WCS Coalition itself acknowledged that filtering technology sufficient to meet a 70 + 10 log (P) dB OOBE limit at 5 MHz from the WCS band edge is

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25 *See* Amendment of the Commission's Rules to Establish Part 27, the Wireless Communications Service, *Report and Order*, 12 FCC Rcd 10785, 10854 ¶ 136 (1997).

26 *See* Rappaport Study.

27 *Id.* at 71.

28 *See* Letter from Michael A. Lewis, Wiley Rein LLP, to Marlene H. Dortch, Federal Communications Commission, WT Docket No. 07-293, IB Docket No. 95-91, Attachment at Slide 13 (filed Feb. 24, 2010).

29 *Id.*

available when it accepted the Commission's application of that limit to protect Aeronautical Mobile Telemetry operations at 2360 MHz and above.[30] In light of this concession, Sirius XM suggested that WCS licensees should be required to attenuate OOBE by a factor of 70 + 10 log (P) dB on satellite radio frequencies that are 2.5 MHz removed from the WCS band edge. This would provide WCS mobile and portable devices with the same 5 MHz transition band established at the lower and upper edges of the WCS allocation.[31] The FCC should modify the newly adopted WCS OOBE limitations accordingly.

C. Duty Cycle Limits for WCS Subscriber Devices Should Be Reduced.

The Ashburn demonstrations proved, and the *Order* acknowledged,[32] that an appropriate duty cycle limitation on WCS user devices is essential to protecting satellite radio consumers from harmful interference.[33] However, the record lacks any technical analysis supporting the Commission's assumption that a flat 38 percent duty cycle for TDD operations across all WCS bands will be sufficient to protect satellite radio receivers. Despite repeated requests by Sirius XM and Commission staff, the WCS Coalition has not produced the log files and test data from its demonstrations at Ashburn, precluding any transparent analysis of the test results. However, the highest duty cycle allegedly demonstrated by the WCS Coalition was 35 percent, a level that

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30 Letter from Paul J. Sinderbrand, Counsel to the WCS Coalition, to Marlene H. Dortch, Federal Communications Commission, WT Docket No. 07-293, IB Docket NO. 95-91 at 1-2 (filed Apr. 30, 2010).

31 *See* Comments of Sirius XM Radio Inc., WT Docket NO. 07-293, IB Docket No. 95-91, GEN Docket No. 90-357, RM No. 8610 at 8 (filed May 13, 2010).

32 *See, e.g.*, *Order* at 32, ¶ 70 ("In order to protect [satellite radio] operations from harmful interference, it is also necessary that we adopt a specific duty cycle that WCS devices must employ for TDD networks.").

33 The *Order* limited devices using TDD technology to a duty cycle of 38 percent while restricting frequency division duplex (FDD) mobile and portable devices to operations in the 2305-2317.5 MHz band and to a duty cycle of 25 percent in the lower WCS A and B blocks

muted satellite radio reception.[34] In light of this evidence, there is no technical justification for the Commission to adopt an *even higher* duty cycle limitation. Like other aspects of the rules, the 38 percent duty cycle simply reflects the off-the-shelf WiMAX equipment that WCS licensees propose to use.[35]

The same holds true with the Commission's failure to specify that duty cycle is to be measured with respect to a time frame of five milliseconds and to restrict uplink transmissions to every other frame.[36] These conditions are fully consistent with the WCS Coalition's efforts to explain both its demonstration setup at Ashburn and how mobile WiMAX devices would operate in the WCS band.[37] Moreover, duty cycle limits would be controlled by the network and thus

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(2305-2315 MHz) and a duty cycle of 12.5 percent in the 2.5 MHz portion of the WCS C block farthest from the satellite radio band edge (2315-2317.5 MHz). *Id.* at 33, 34, Para. 72.

[34] *Id.* at 30, ¶ 64. Indeed, the WCS Coalition asserts that the test case in question employed a 250 mW transmit power, a 5 MHz carrier, a 2.5 MHz guard band and a 35 percent duty cycle. Under these conditions—each identical or less restrictive than those adopted in the *Order*—muting occurred to a satellite radio receiver separated by at least 3 meters. Ignoring these facts, the Commission concludes that its newly adopted rules "will reduce the risk of harmful interference to SDARS to a negligible level." *Id.*

[35] *Compare id.* at 27 n.158 (discussing FCC staff's March 2 proposal for graduated duty cycle limitations ranging from 12.5 percent nearest to the satellite radio band to 35 percent at the farthest points of the WCS spectrum, based on the technical demonstrations at Ashburn), *with id.* at 33-34, ¶¶ 71-73 (noting the issues related to commercial availability of WiMAX equipment that led to the decision to adopt a flat 38 percent duty cycle limit).

[36] *Id.* at 34, ¶ 73.

[37] The WCS Coalition questioned how Sirius XM replicated a WiMAX uplink at Ashburn, stating: "In an operating [TDD] system you have a transmission followed by guard time, followed by a reception followed by guard time and then it is repeated as necessary. In order to accurately represent the actual behavior of a two-way signal, SDARS should have modulated 5 ms followed by a 5 ms (or slightly more to accommodate guard time) off time followed by the next transmit frame. SDARS did not do this, but rather just burst the channel (or some subset of tones) 6, 12, or 25% of the time. It appears that Sirius XM showed nothing more than the effect of average power density, based on a duty cycle of a transient waveform. If done properly (modulated 5 ms followed by a 5 ms dead time) then the test would have been a more accurate representation of the operation of a mobile device." *See* Letter from Mary N. O'Connor, Counsel to the WCS Coalition, to Marlene H. Dortch, Secretary, Federal Communications Commission, Exhibit B at 1 (filed Aug. 4, 2009).

would require no special design modifications for WCS mobile devices that could potentially complicate standardization or otherwise delay deployment.

The Commission adopted no such protections, instead "requir[ing] WCS licensees to apply the duty cycle requirement in a manner that is referenced directly to the frame duration for the technology in use in order to strike an appropriate balance between our goals of protecting SDARS receivers from harmful interference and enabling the provision of WCS mobile broadband services."[38] Ignoring evidence demonstrating the potentially severe impact on satellite radio listeners,[39] the FCC declined to adopt restrictions on WCS mobile devices based on its desire to make the WCS service more commercially appealing. This "thumb-on-the-scale" regulatory approach simply ignores the needs of satellite radio's tens of millions of listeners. The Commission should further consider whether imposing restrictions on the WCS repetition rate would mitigate interference at a low cost to equipment manufacturers and WCS service providers.[40]

III. THE COMMISSION MUST ADOPT ADDITIONAL MEASURES TO MITIGATE OVERLOAD INTERFERENCE.

The *Order* correctly recognized that overload interference is one of the most significant sources of harmful interference for both satellite radio and WCS receivers.[41] Sirius XM has long understood the need for any modified technical rules to address the problem of overload,

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38 *Id.*

39 *See* Sirius XM April 23, 2010 Comments at Technical Appendix.

40 Discussions between the parties, including Commission staff, made clear that there is some confusion about nomenclature and description of this issue. *See, e.g.*, Letter from Jennifer M. McCarthy, Vice President, Regulatory Affairs, NextWave Wireless Inc., to Marlene H. Dortch, Secretary, FCC, WT Docket No. 07-293, IB Docket No. 95-91, Attachment at 2-3 (filed Nov. 17, 2008). This confusion could largely be eliminated if the log files from the WCS Coalition's demonstration in Ashburn were made public, permitting analysis of the spectrum signature of the transmissions.

particularly overload caused by the high signal levels produced by fixed infrastructure transmitters.[42] In light of this challenge, Sirius Satellite Radio's 2006 Petition for Rulemaking in this proceeding proposed establishing ground level emissions limits for satellite radio terrestrial repeaters and WCS base stations.[43]

A ground level emissions limit would address the problem of overload interference better than transmitter power limits because the former metric goes to the actual source of overload interference, *i.e.*, an overabundance of received energy in adjacent bands. A ground level emissions limit would also afford licensees increased flexibility and greater overall protection by recognizing that in certain circumstances, depending upon factors such as antenna height, terrain, and network density, higher transmitter powers may not pose a substantial risk of overload interference. Conversely, in other scenarios, even lower signal strengths can cumulatively result in unreasonably high levels of received energy, causing adjacent channel receiver overload.

The rules the Commission ultimately adopted do little to address the real causes of overload interference. The 2006 White Paper demonstrated that overload interference can occur with ground-based emissions levels as low as -57 dBm.[44] Even with reasonable signal power limitation on fixed infrastructure transmitters, "hot spots" may develop near base stations or

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41 *See Order* at 43, ¶ 96.

42 *See* White Paper: Interference to the SDARS Service from WCS Transmitters, *attached to* Letter from Carl R. Frank, Counsel to Sirius Satellite Radio Inc., to Marlene H. Dortch, Federal Communications Commission, WT Docket No. 05-256, IB Docket No, 95-91 (filed Mar. 29, 2006) ("2006 White Paper").

43 *See* Sirius Satellite Radio Inc., Petition for Rulemaking at 4 (filed Oct. 17, 2006). That proposal would have limited satellite radio and WCS licensees to creating a received power limit of no greater than -44 dBm as measured two meters from the ground at a distance from the base of the antenna equal to or greater than the effective antenna height above ground level of the base station or terrestrial repeater. *Id.* at Appendices A, proposed Section 25.231(d)(2)(A)(i) and B, proposed Section 27.50(a)(1)(A).

44 2006 White Paper at 13.

terrestrial repeaters that would result in overload interference to adjacent band receivers. Sirius XM's recent study of Clear's 2.5 GHz WiMAX network in Philadelphia demonstrated just this concern.[45] In fact, these technical measurements revealed ground-based signal levels as high as -35 dBm caused by the WiMAX base stations, more than enough to cause crippling overload interference to satellite radio listeners.[46]

The Commission must adopt rules providing protection to both Sirius XM and WCS licensees from overload interference caused by relatively high powered fixed infrastructure transmitters. Sirius XM continues to support ground-based limits as previously proposed, which would effectively prevent interference before it occurs. Failing that, the FCC must at least provide further guidance as to what would constitute harmful interference to help minimize licensee disputes and expedite efforts to remove interference.

The Commission must also further clarify footnote 315 in the Order,[47] in which the FCC provides what it calls an "illustrative example" of interference that a Sirius XM radio could expect to receive from a WCS base station transmitter operating with a peak EIRP of 8 kW (which is consistent with the old WCS rules) at a height of 30 meters. Based upon receiver specifications supplied by Sirius XM, the Commission calculates that interference would be received when a satellite radio is within 347 meters of a WCS transmitter. The FCC asserts that the newly-adopted rules would decrease this separation distance, but does not specify by how much.

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45 *See* Letter from Michael A. Lewis, Wiley Rein LLP, to Marlene H. Dortch, Federal Communications Commission, WT Docket No. 07-293, IB Docket No. 95-91, Attachment at slides 8-9 (filed Feb. 24, 2010).

46 *Id.*

47 *See Order* at n.315.

As an initial matter, Sirius XM disagrees with the Commission's assertion that it used "an empirical path loss model suitable for an urban environment under these conditions."[48] Indeed, the COST 231 propagation model used by the Commission is suitable only for carrier frequencies between 1500 and 2000 MHz and for separation distances exceeding 1 km.[49] The Commission's conclusions are therefore inherently flawed. More to the point, however, Sirius XM has consistently argued that base station power limits must be augmented through ground-based emission limits to more accurately prevent the type of interference predicted in the footnote's calculations. If Sirius XM's receivers experienced muting every time they came within a few hundred meters of a WCS base station (which will number in the hundreds, possibly thousands, in each metropolitan area), it could cripple satellite radio service. The Commission must define a more appropriate coexistence paradigm between these services.

IV. THE COMMISSION SHOULD REVISE THE NOTIFICATION AND COORDINATION REQUIREMENTS BETWEEN THE SERVICES.

The *Order* correctly recognized that effectively avoiding harmful interference between satellite radio and WCS broadband services will require ongoing cooperation and coordination between the licensees, particularly with respect to deployments of WCS base stations and satellite radio terrestrial repeaters. However, the *Order* requires greater specificity and clarity to accomplish the Commission's goals.

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48 *Id.*

49 Andrea Goldsmith, *Wireless Communications* 44, Cambridge University Press, 2005 (explaining that the COST 231 propagation model is restricted to carrier frequencies between 1.5 GHz and 2 GHz, transmitter heights between 30 meters and 200 meters, receiver heights between 1 meter and 10 meters, and separation distances between 1 kilometer and 20 kilometers). *See also id.* at 43-44 (noting that the Hata model, on which COST 231 is based, "does not model propagation well in current cellular systems with smaller cell sizes and higher frequencies.").

A. The Commission Should Clarify the Duty to Cooperate between Satellite Radio and WCS Licensees in Selecting and Developing Base Stations.

Minimizing the likelihood of interference in these adjacent band services will require real cooperation between licensees, not merely printed rules. Recognizing this reality, the FCC said it expects licensees in these services "to work together cooperatively and take whatever steps are necessary to mitigate potential harmful interference and expeditiously remedy harmful interference, should it occur."[50] The Commission went on to explain:

> During the time when market trials begin but full commercial service has not yet been initiated, the licensees will have an opportunity to conduct further tests using actual WCS equipment in particular markets. We expect any interference issues that arise during market trials to be resolved before the transition from market trials to commercial service happens.[51]

Sirius XM agrees that conducting tests prior to initiating commercial WCS mobile service using operational devices and infrastructure will be critical to help provide real-world validation of preliminary pre-construction interference analysis. However, by using the term "market trials" to identify the pre-operational phase, the FCC may have inadvertently restricted this coordination to a limited circumstance involving only a small subset of all WCS base stations. Since the Commission did not define what it means by a "market trial" or require that a WCS station undergo any pre-operational "market trial," the agency created uncertainty as to how and when such cooperation is required before a WCS station provides service to the public.

At minimum, the FCC should: (1) clarify its intention to create a duty to cooperate on behalf of WCS licensees; (2) specify that the information to be provided by WCS licensees includes location and operational characteristics of base stations; and (3) require WCS licensees to facilitate base station testing with Sirius XM before commencing commercial service on any

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50 *Order* at 35, ¶ 77.

51 *Id.* at 36, ¶ 80.

new or modified base stations. Sirius XM has previously proposed language modifying Section 27.72(e) of the Commission's rules to make this clear (proposed additions are underlined):

> (e) Duty to Cooperate. WCS licensees must cooperate in good faith in the selection and use of new station sites and new frequencies to reduce interference and make the most effective use of the authorized facilities. WCS licensees should provide SDARS licensees with advance information regarding the location and operation of base stations, allowing as much lead time as practicable to provide ample time to conduct analyses and opportunity for prudent base station site selection prior to WCS licensees entering into real estate and tower leasing or purchasing agreements. After providing the information required by Section 27.72(b), a WCS licensee shall cooperate with an SDARS licensee seeking to test the potential of a new or modified site to create harmful interference prior to commencing commercial service using that site. WCS licensees must have sufficient operational flexibility in their network design to implement one or more technical solutions to remedy harmful interference. . . .

Sirius XM urges the Commission to adopt these clarifications.

The FCC should also make clear that cooperation between WCS and satellite radio requires, at minimum, that the licensees work together to ensure the site information exchanged is in a format that the parties can effectively incorporate into their engineering databases, allowing them to promptly and accurately determine the likelihood of harmful interference caused by the other's facilities. In the context of commencing operations with new or modified facilities, cooperation should specifically require WCS licensees to establish a single point of contact in the WCS community that will provide this information to Sirius XM, such as through an information clearinghouse as the Commission requires in other contexts.[52] WCS licensees

[52] *See, e.g.*, Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems, *Order*, 22 FCC Rcd 4680 (2007) (Ordering CTIA-The Wireless Association and PCIA-The Wireless Infrastructure Association to serve as a neutral, not-for-profit clearinghouse to administer the FCC's AWS cost-sharing plan); Microwave Relocation, *Memorandum Opinion and Order*, 11 FCC Rcd 9394 (1996) (Designating PCIA and the Industrial Telecommunications Associations, Inc. as the clearinghouses to administer the Commission's microwave relocation cost-sharing plan).

should also provide Sirius XM with a schedule of when network base stations will be transmitting and make pre-sale WCS consumer devices available to Sirius XM for testing.

The Commission should facilitate the coordination process by clearly identifying objective interference criteria. The *Order* referenced the definition of harmful interference in Section 2.1 of the Rules as "[i]nterference which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs, or repeatedly interrupts a radiocommunication service operating in accordance with [the ITU] Radio Regulations."[53] However, a more detailed set of interference criteria, based on objective parameters specific to the context at hand, would be more useful to establish rights and obligations to resolve interference. Sirius XM previously recommended a process for identifying and resolving instances of harmful interference.[54] The Commission should revisit this proposal and prescribe such a process. This clarification, along with those discussed above, will help avoid misunderstandings, help obviate the need for continued Commission oversight, and ultimately help to avoid interference to satellite radio consumers.

B. The Commission Should Redefine What Constitutes a "Potentially Affected" WCS Licensee.

The new rules require Sirius XM to obtain site-by-site licenses for repeaters not subject to blanket licensing until notified by a "potentially affected" WCS licensee that it wishes to commence operations.[55] Notification by a potentially affected licensee triggers a 180-day period for Sirius XM to turn off the existing repeater or bring it into conformance with power and

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53 *See* 47 C.F.R. § 2.1.

54 *See* Letter from Terrence R. Smith and James S. Blitz, Sirius XM Radio Inc., to Julius P. Knapp, Federal Communications Commission, WT Docket No. 07-293, IB Docket No. 95-91 (filed March 17, 2010).

55 *See Order* at 100, ¶ 260.

OOBE limits.[56] The rules define a WCS licensee as "potentially affected" if it operates a base station in the same Major Economic Area (MEA) or Regional Economic Area Grouping (REAG) as the one in which the terrestrial repeater is located, or if a terrestrial repeater transmits from within 5 km of the border of the MEA or REAG in which the WCS licensee is authorized to operate a base station.[57]

The Commission's definition of a "potentially affected" WCS licensee is grossly overbroad. Under this rule, WCS licensees operating hundreds, even thousands of miles from the terrestrial repeater are considered "potentially affected" such that they could require modification of Sirius XM's network when no interference could conceivably occur.[58]

Rather than requiring modification of terrestrial repeaters to provide meaningless "protection" to WCS operations, the Commission should adopt a more narrowly tailored coordination distance of 5 km.[59] The *Order* calculated that overload interference to WCS receivers would occur within approximately 300 meters from 12 kW terrestrial repeaters.[60] Extrapolating from this conclusion, a 5 km separation would provide adequate interference protection to WCS receivers operating near Sirius XM's highest powered repeaters. Moreover, the Commission explicitly recognized 5 km as being sufficient separation when it required modification of nonconforming terrestrial repeaters located within only 5 km of a WCS base station located on the edge of a REAG or MSA. If, as the rules clearly contemplate, a non-

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56 *Id.*

57 *See id.*, Appendix B, Section 25.214(d).

58 For example, the rules would allow a WCS licensee planning to commence service in San Diego, California, to require that Sirius XM modify the operation of an existing terrestrial repeater outside Seattle, Washington, well over 1,000 miles away.

59 *See* Sirius XM Apr. 23, 2010 Comments at 39-40.

60 *Id.* at 95, ¶ 241.

conforming satellite radio terrestrial repeater may operate at any distance more than 5 km away from a WCS base station without additional interference protection where they are in different REAGs or MSAs, there is no need to require a terrestrial repeaters to power down if it is separated from a WCS base station by hundreds of times that distance.

Moreover, the rationale underlying the Commission's analysis of this issue is flawed. The Commission acknowledges that the proposed definition may "over-include the number of repeaters that need to be modified" but it claims this result is "consistent with the public interest in having as many SDARS repeaters as possible authorized through a blanket license according to the power level and OOBE standards adopted [in the *Order*]."[61] Regardless of the merits of blanket licensing, the public interest is hardly served by requiring Sirius XM to reduce satellite radio service to its customers where a terrestrial repeater must be modified or turned off due to the planned construction of a WCS facility hundreds of miles away.

On this point, the Commission says it does not expect WCS licensees to act in "bad faith" when proposing to deploy facilities near terrestrial repeaters operating in excess of the base technical limits.[62] But at minimum, the Commission should clarify that WCS licensees must limit such notifications to base station sites that can be predicted to potentially receive overload interference from terrestrial repeaters and that issuing a blanket notification for all locations would *per se* constitute "bad faith."

C. The Commission Should Clarify That Very Low Power Terrestrial Repeaters are Exempt from the Notification Requirements.

The Commission should clarify that the new terrestrial repeater notice requirements do not pertain to very low power terrestrial repeaters, *i.e.*, those operating at less than 2 W EIRP.

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61 *Id.* at 101, ¶ 262.

62 *Id.* at ¶ 263.

The Commission previously recognized that such repeaters are properly subjected to a lesser degree of regulatory scrutiny since they pose no realistic interference risk and imposing these requirements to low powered repeaters would be overly burdensome.

The *Order* requires Sirius XM to provide WCS licensees with an inventory of its deployed terrestrial repeater infrastructure.[63] Similarly, Section 25.263(c)(3) of the Rules requires Sirius XM to maintain an inventory of its terrestrial repeaters operating above 2 W EIRP for purposes of Commission inspection. Reading these obligations together, it seems apparent that the FCC did not expect Sirius XM to include information concerning repeaters operating at less than 2 W EIRP in its initial inventory to WCS licensees.

In exempting very low power repeaters from Section 25.263(c)(3) of the Rules, the Commission correctly concluded that such facilities pose no realistic risk of interference to WCS receivers and have no significant value in the coordination process between WCS and Sirius XM. The Commission has recognized for years that these very low power repeaters present virtually no concern to WCS licensees and others, authorizing Sirius XM to use them pursuant to "blanket" STAs that do not require Sirius XM to identify the locations of each such facility.[64] The Commission could not have intended that Sirius XM identify the location of these repeaters to WCS licensees under the new licensing rules when it did not even impose such a requirement under the more rigid STA regime and the Commission does not require Sirius XM to maintain that information for even the Commission's own review. The Commission should clarify that

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63 *See id.* at 106, ¶ 278.

64 For example, pursuant to blanket authorizations, Sirius XM is authorized to operate very low power repeaters and boosters at undisclosed in-store and other indoor locations for up to 180 days at trade shows and similar events and demonstrations. *See e.g.,* SAT-STA-20100303-00039, SAT-STA-20070706-00095 and SAT-STA-20070706-00096.

this was not its intention in requiring Sirius XM to provide an inventory of existing repeaters to potentially affected WCS licensees.

Similarly, Section 25.263 of the new rules requires Sirius XM to provide potentially affected WCS licensees with advance notice before commencing operation of a new terrestrial repeater or modifying an existing repeater. For the same reasons discussed above with reference to the inventory of Sirius XM's existing repeaters, the Commission should clarify that its intention was to exempt repeaters operating with under 2 watts EIRP from the notice requirements in Section 25.263(b) of the Rules.

V. CONCLUSION

For the reasons stated above, the Commission should reconsider and clarify the *Order* and amend the rules adopted therein as appropriate.

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