SIRIUS SATELLITE RADIO INC.
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New York, NY 10020

XM RADIO INC.
1500 Eckington Place, NE
Washington, DC 20002

Filed Electronically

July 2, 2008

Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20554

Re: *Establishment of Rules and Policies for the Digital Audio Radio Satellite Service in the 2310-2360 MHz Frequency Band*, IB Docket No. 95-91; *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

Dear Ms. Dortch:

The recent filings by XM Radio Inc. ("XM") and Sirius Satellite Radio Inc. ("Sirius") in this proceeding have encouraged the Commission to require the use of independent third party testing to resolve disputed technical issues and expedite completion of these dockets. In the interest of focusing on the development of those tests, we have chosen not to respond to multiple misstatements regarding technical matters that the WCS Coalition (the "Coalition") continues to place in the record.[1]

Nevertheless, one of the Coalition's repeated misstatements requires a response because it wrongfully and unfairly calls into question the qualifications and integrity of third party experts who have conducted tests on the key issue of the noise floor of a satellite radio receiver. Specifically, Sirius and XM each presented reports from an independent test laboratory certifying that for each company's satellite radio system, the

[1] XM and Sirius addressed defects in the Coalition's initial comments in our March 24 reply filing. However, additional errors run throughout the Coalition's reply comments, including new claims presented there for the first time, and in the Coalition's subsequent ex parte letters. These significant differences between the test results presented by the two sides in this proceeding demonstrates why the joint third party testing we have proposed is the best path to resolving these and other technical contentions. Should joint testing not occur, we expect to fully respond to the Coalition's technical showing at the appropriate time. Until we do so, we simply note that the record in this proceeding is necessarily incomplete.

relevant noise floor level is -113 dBm/4 MHz. These conclusions reflected properly conducted tests overseen by Dr. Vichate Ungvichian, director of the EMI Research and Development Laboratory (the "EMI Lab"), an entity associated with the Department of Electrical Engineering at Florida Atlantic University, and designed by Dr. Argy Petros, the founder of Think Wireless, Inc., and an expert in the field of satellite radio antenna technology. In their Comments, XM and Sirius each provided test reports from the EMI Lab describing the test procedures and provided all the relevant test parameters supporting their conclusions.[2]

The WCS Coalition's response to these expert reports has been to attack the testers rather than to repeat the tests using the parameters provided in the reports. The Coalition simply asserts that "the measurements are in error" and the testers did not follow basic process,[3] speculating that the experts' noise floor calculations "do not follow test equipment manufacturers [*sic*] recommendations for measuring noise."[4] The Coalition hypothesizes – with no foundation – that the alleged error's "likely sources" are "improper spectrum analyzer setup and operation, out of date calibration, and/or improper interpretation of the spectrum analyzer readings,"[5] claiming that the LNA gain figures "are likely approximations rather than actual measured values." And the Coalition impugns the expert testing in other respects: "It also is suspected that the measurements were likely made in a rural area, possibly at night, to portray the absolute best case scenario by reducing the outside noise input to the LNA."[6] Most puzzlingly, the Coalition questions actual, measured data produced by independent, highly regarded engineers, on the basis of a misplaced theoretical calculation that would be more appropriately used to determine the noise floor in a terrestrial radio system but which does not apply to a satellite system such as XM and Sirius operate.[7] Notably, the Coalition assumes a value of 290 degrees Kelvin to calculate its theoretical noise floor.[8] This value is contradicted by satellite engineering experts and in industry-standard desk references, which note that 290 degrees K is a typical antenna noise temperature for terrestrial radio, but that a for a satellite radio antenna directed 5 degrees above the

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2 *See* XM Comments, Exhibit C, Appendix 1 (Feb. 14, 2008); Sirius Comments, Appendix (Feb. 14, 2008).

3 Specifically, the Coalition has claimed that the noise floor of a SDARS receiver is -106.8 dBm/4 MHz, as opposed to the -113 dBm noise floor demonstrated by XM and Sirius. This Coalition claim results in a substantial overstatement of the tolerance of SDARS receivers for interference from WCS mobile terminals – on the order of 6 dB.

4 WCS Coalition Ex Parte, Attachment at slide 24 (filed May 5, 2008). *See* Coalition Reply Comments, Attachment A, at 5 (March 17, 2008) ("Coalition Attachment A").

5 Coalition Attachment A at 4-5.

6 *Id.* at 5.

7 *Id.* at 4, *see also,* WCS Reply Comments at 11 n.28.

8 Coalition Attachment A at 4.

horizontal and operating in the range from 3 GHz down to 1 GHz, the noise temperature typically falls within the range of 60-90 degrees Kelvin.[9]

The Coalition's arguments are unfounded, unfair to the independent test bodies, and suggest a fundamental misunderstanding of satellite technology and how it varies from cellular telephony and other wireless services. First of all, the Coalition's attacks on the third party tests submitted by XM and Sirius are simply wrong. This is apparent from a fair reading of the test reports themselves, which clearly describe the methodology used. To dispose of this issue, attached hereto are further certifications from the laboratory that conducted the noise floor measurements and from the expert who designed the tests. In their certifications, the independent engineers first emphasize that they have a long history of electromagnetic compatibility research and testing and associated emission evaluations.[10] With respect to Dr. Petros, this background includes extensive experience with the satellite radio antennas used by XM and Sirius. In short, Dr. Ungvichian and Dr. Petros are experts in both noise floor tests in general and the XM and Sirius systems in particular.

Furthermore, Dr. Ungvichian of the EMI Lab reconfirms that qualified engineers conducted the tests properly and according to the exact testing methodology and parameters provided by Dr. Petros, who states that the parameters conform with well-established methodologies and that the results of the testing are accurate. Contrary to the Coalition's speculation, the EMI Lab technicians used spectrum analyzers that were carefully, correctly, and fully calibrated (including cross-checked with another calibrated spectrum analyzer).[11] Consistent with the EMI Lab's extensive experience with emissions testing, they used appropriate test procedures, including proper set up, operation, and measurement reading. The certification supplied by Dr. Petros explains that the satellite radio low noise amplifier gains used in the calculations were as specified by the antenna manufacturers.[12] The antenna manufacturers themselves confirm that the results documented in the test reports are valid and consistent with their experience in the manufacturing and design of satellite radio antennas.[13] Furthermore, both certifications

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[9] Certification of Argy Petros, Ph.D., Think Wireless, Inc., 3 (June 26, 2008) (attached) ("Petros Certification") (citing W. Lee, Mobile Cellular Telecommunications Systems, 23 (1989), H. Sams, Reference Data for Radio Engineers, 29-1 (1979)).

[10] Petros Certification at 1-2; Certification of Vichate Ungvichian, Ph.D., P.E., Director, FAU EMI R&D Laboratory, 1 (June 16, 2008) (attached) ("EMI Certification").

[11] EMI Certification at 1-2 (supplying calibration information).

[12] Petros Certification at 2-3.

[13] XM and Sirius have filed letters from satellite antenna manufacturers in the above-referenced dockets. See Letter from Andreas Fuchs, Director of Advanced Engineering, Telematics Solutions, Laird Technologies, Subject: Affect of Noise Level of Satellite Radio Antennas (Apr. 24, 2008) (filed by Carl Frank, Counsel for Sirius Satellite Radio Inc. on May 21, 2008); Letter from Pierre L. Wassom, Senior Antenna Design Engineer, Mitsumi Electric Co., Ltd., Re: Noise Floor Affect on SDARS Antennas (May 30, 2008) (filed by James S. Blitz, Vice President, Regulatory Counsel to XM Radio Inc on June 11, 2008).

make clear that the Coalition's speculation that the tests were conducted at night in a rural area is plainly wrong. Quite the contrary, the measurements were made in a suburban location during daylight hours on two separate occasions as specified in the test plan designed by Dr. Petros.[14] The engineers reiterate their findings and stand firmly behind the test results.

Importantly, the relevant measurement parameters used by the third party engineers were spelled out in their reports accompanying XM and Sirius's comments in this proceeding and these parameters are described in even greater detail in the attached certifications. These results are transparent, so that the tests can be replicated. In contrast, the WCS Coalition provides no similar transparency to support its own noise floor claims. For example, the Coalition purports to provide bottom line Sirius values from a test by NextWave Broadband, but fails to provide key measurement parameters or the resulting noise floor calculation.[15] As for XM's noise floor, the Coalition provides no data at all, arguing only that it has "concerns that the module gain is below expected value and therefore the noise measurement may be invalid."[16]

More recently the Coalition has even tried to argue that the noise floor of satellite radio receivers is irrelevant to this proceeding, stating that: "a rise in the noise floor is of no moment to a SDARS subscriber if it does not result in muting, and the record establishes that, under a probabilistic model, such muting will be rare".[17] Its position appears to be that if particular (yet to be defined or produced) mobile WiMax equipment destroys all of a receiver's satellite link margin up to muting at a given location, then no harmful interference to a satellite radio consumer occurs. There is, however, no basis for this argument because it assumes that all areas served by the SDARS systems receive satellite signals with high signal to noise ratios and would therefore not be harmed by a rise in the noise floor. In fact, satellite signal to noise ratios vary widely depending on location, time of day (and year), foliage, satellite signal blockage conditions, etc. It is often the case that SDARS service is dependent on receiving the signal of a single satellite with low signal to noise ratio. In these circumstances, a small increase in the noise floor can result in disruption of service.

To be clear, XM and Sirius strongly dispute many technical arguments in recent WCS Coalition filings, including attacks on the tests of our own engineers. However, we decline to address these issues at this time because the third party joint testing we have proposed can best move this proceeding forward by helping the Commission gather data addressing these and other contested technical questions. XM and Sirius are committed to working with the Commission staff and the Coalition to complete a test plan and assist an independent third party conducting the tests. However, regardless of our commitment

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14 Petros Certification at 1; EMI Certification at 1.

15 *See* Coalition Attachment A at 5.

16 *Id.*

17 Letter from Paul J. Sinderbrand, Counsel to the WCS Coalition, to Marlene H. Dortch, Secretary, FCC, Written Ex Parte Presentation at 5 (filed May 19, 2008).

to joint testing, the Coalition's attacks on our own experts are baseless and unwarranted and cannot be allowed to stand unrebutted.

Respectfully submitted,

/s/ Patrick L. Donnelly
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CERTIFICATION

Think Wireless, Inc.
5497 Wiles Road, Suite 205
Coconut Creek, FL 33073

June 26, 2008

This certification is written in reference to satellite radio receiver noise floor measurements taken by the EMI Research and Development Laboratory at Florida Atlantic University ("FAU EMI Laboratory") and documented in Technical Report Nos. 07-119a and 07-119b (the "Technical Reports"). The Technical Reports were filed with the Federal Communications Commission on February 14, 2008 in WT Docket No. 07-293 and IB Docket No. 90-357.

I, Dr. Argy Petros, do hereby certify the following:

1. I am the President and Founder of Think Wireless, Inc. ("TW"), where I have been employed since 2003. I received a B.S.E.E., M.S., and Ph.D. in electrical engineering from the Virginia Polytechnic Institute. I have been awarded 20 U.S. patents and have authored numerous publications in the field of electrical engineering and RF propagation. I am a Senior Member of the IEEE and was inducted into NASA's Space Technology Hall of Fame in 2001. I have 16 years of experience in designing RF antennas and other products and in conducting propagation measurements. I have 12 years of experience in developing and manufacturing wireless products. Before founding TW, I was previously employed with Motorola's Cellular Design Center in Boynton Beach, Florida, and the XM Radio Innovation Center in Boca Raton, Florida. In these positions, I designed antennas, RF circuits and low noise amplifiers, and performed numerous RF propagation measurements. Specifically, with respect to satellite radio systems, I was in charge of all antenna design efforts, specification documents, and developed several innovative concepts. Some of these concepts are shown in the patents listed below:

- *Combination satellite and terrestrial antenna, A. Petros, T. C. Helstrom, I. Zafar, No. 6,806,838, (8/19/2004).*
- *Electronically steerable antenna array using user-specified location data for maximum signal reception based on elevation angle, A. Chatzipetros and S. Patsiokas, No. 6,640,085, (10/28/2003).*
- *Combination linearly polarized and quadrifilar antenna sharing a common ground plane, A. Petros and T. C. Helstrom, No. 6,621,458, (9/16/2003).*
- *Glass-mountable antenna system with DC and RF coupling, A. Nguyen and A. Petros, No. 6,538,609, (3/25/2003).*
- *Drooping helix antenna, A. Petros, No. 6,535,179, (3/18/2003).*

- *Combination linearly polarized and quadrifilar antenna, A. Petros, No. 6,483,471 (11/19/2002).*
- *Vehicle antenna assembly for receiving satellite broadcast signals, A. Chatzipetros, S. Patsiokas, and A. Nguyen, No. 6,421,020, (7/16/2002).*

2. TW specializes in wireless product development and manufacturing and has established partnerships with companies and individuals having experience in various aspects of wireless communications. TW provides services for antenna simulation as well as for the laboratory and field test measurements of antennas. TW has extensive experience, in particular, with the SDARS subscriber antennas deployed by Sirius Satellite Radio Inc. ("Sirius") and XM Radio Inc. ("XM"). TW contracted with Sirius and XM to construct test parameters for an independent test to measure the noise floor in the satellite radio frequency bands for the XM and Sirius satellite radio systems.

3. I am the technically qualified person responsible for designing the test parameters for the FAU EMI Laboratory tests documented in the Technical Reports. I have reviewed the allegations made by the WCS Coalition concerning the FAU EMI Laboratory's testing and the test parameters used in preparing the Technical Reports. I certify that the test parameters supplied to the FAU EMI Laboratory are proper methods for measuring noise floor in a satellite radio receiver, and that the results documented in the Technical Reports are correct. In particular:

   (a) The procedure used and documented in the Technical Reports is a valid procedure for measuring the noise floors of XM and Sirius subscriber satellite receivers.

   (b) The test plan specified that the satellite receiver noise floor measurements would be taken outdoors, during daytime hours outside the Think Wireless Inc. facility: 5497 Wiles Rd. in Coconut Creek, FL 33067. This is an appropriate time and location for such measurements because it represents real-world conditions: daytime hours and a suburban environment.

   (c) As set forth in the test plan supplied to the FAU EMI Laboratory, XM car antennas (manufactured by Mitsumi) and Sirius car antennas (manufactured by Laird) were used in the test documented in the Technical Reports. The FAU EMI Laboratory calculations used LNA gains that were measured in the Think Wireless radio frequency laboratory. These LNA gains have been verified to be correct and accurate to within acceptable tolerances for the noise floor measurement tests. All LNA gains were measured using a calibrated network analyzer. The test plan did not specify that the gain figures should be approximated or "rounded". Accordingly, the FAU EMI Laboratory used actual,

measured figures in calculating the noise floor of the respective satellite radio systems.

(d) The results produced and documented in the Technical Reports are consistent with the theoretical noise floor that can be expected in a satellite radio system. A proper theoretical noise floor for satellite radio would not assume an antenna temperature of 290 degrees K, which is the antenna temperature that would be appropriate for a theoretical noise floor for terrestrial radio[1]. The temperature of an antenna used for satellite communications is much lower than 290 K[2] since open sky with low temperature is the major contributor to the overall noise temperature.

Argy Petros, Ph.D.
President, Think Wireless, Inc.

[1] Terrestrial radio systems typically have an antenna noise temperature of 290 degrees K. See W. Lee, Mobile Cellular Telecommunications Systems, 23 (1989).

[2] Satellite radio systems have antennas with typical antenna noise temperatures in the range of 60 to 90 degrees. See H. Sams, Reference Data for Radio Engineers, 29-1 (1979).

CERTIFICATION

EMI Research and Development Laboratory
Department of Electrical Engineering, Florida Atlantic University
3998 FAU Blvd, Suite 310, Boca Raton, Florida 33431

June 16, 2008

This certification is written in reference to satellite radio receiver noise floor measurements taken by the EMI Research and Development Laboratory ("FAU EMI Laboratory") and documented in Technical Report Nos. 07-119a and 07-119b (the "Technical Reports"). The Technical Reports were filed with the Federal Communications Commission on February 14, 2008 in WT Docket No. 07-293 and IB Docket No. 90-357.

I, Dr. Vichate Ungvichian, do hereby certify the following:

1. I am the Director of the FAU EMI Laboratory. I have held this post for more than 20 years. I received my Ph.D. in 1981 from the Ohio University and the P.E. from the state of Florida. I have more than 20 years of experience with highly specialized RF engineering, including EMI mitigation, electromagnetic modeling, antenna design and electromagnetic field characterization.

2. The EMI Laboratory has an ISO 17025 qualification and has been accredited by the American Association for Laboratory Accreditation (A2LA) for technical competence in electromagnetic compatibility testing, FCC Part 15 and CISPR22 radiated and conducted emission evaluations.

3. I oversaw the preparation of Technical Reports concerning the Noise Floor measurement in the Satellite Radio Band. The tests were conducted during daytime hours, at 5497 Wiles Rd., Suite 205, Coconut Creek, FL 33073.

4. I certify that the measurements documented in the Technical Reports adhere to the procedures provided by Dr. Argy Petros of Think Wireless, Inc. In particular:

   (a) An Agilent spectrum analyzer (Model Number E4404B) was used to conduct the tests documented in the Technical Reports. The spectrum analyzer was set up and operated in accordance with the manufacturer specifications.

   (b) The Agilent spectrum analyzer used to conduct the tests documented in the Technical Reports was calibrated using the signal from its instrument Cal output. On November 26, 2007, the

spectrum analyzer reading was within the Cal output value. On April 2, 2008, the Agilent spectrum analyzer was cross-checked with a Rhode and Schwartz spectrum analyzer, Model FSIQ7, which was within the calibration cycle, (Cal due date was April 27, 2008).

(c) LNA gains used in the calculations set forth in the Technical Reports were the exact parameters provided by Think Wireless Inc.

(d) The satellite receiver noise floor measurements were taken outdoors by qualified FAU EMI Laboratory personnel together with Dr. Argy Petros of Think Wireless, during daytime hours at 5497 Wiles Rd., Suite 205, Coconut Creek, Fl 33073, as specified by the test procedure supplied by Think Wireless, Inc.

(e) The FAU EMI Laboratory personnel and Dr. Argy Petros of Think Wireless took additional measurements using the same testing procedure during daylight hours on April 2, 2008. The additional measurements yielded results that could be expected given the measurement tolerances of the test equipment and environmental conditions.

Vichate Ungvichian, Ph.D., P.E.
Director, FAU EMI R&D Laboratory