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October 9, 2015

VIA ELECTRONIC FILING

Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: Assignment Applications of T-Mobile License LLC and Cellco Partnership d/b/a Verizon Wireless and Certain of Its Subsidiaries, ULS File Nos. 0006867447, 0006868438, 0006868544, 0006867476, 0006867520, 0006867467, 0006867470, 0006867545, 0006867559, 0006868798, 0006869754, 0006869768, 0006869777, 0006869790, 0006869871, and 0006869873

Dear Ms. Dortch:

Earlier today, Sirius XM Radio Inc. filed the attached letter in response to a series of spectrum lease notifications filed by T-Mobile and AT&T. Because that letter addresses matters related to the T-Mobile-Verizon spectrum “swap,” we are submitting a copy in connection with the above-referenced applications in order to ensure the completeness of the record.

Please contact the undersigned should you have any questions.

Respectfully submitted,

/s/ John P. Janka

John P. Janka
Jarrett S. Taubman

Counsel to Sirius XM Radio Inc.

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October 9, 2015

VIA ELECTRONIC FILING

Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: Lease Notifications of T-Mobile and AT&T, ULS File Nos. 0006972875, 0006973050, 0006973114, 0006973176, 0006973217, 0006973228, 0006973267, and 0006973430

Dear Ms. Dortch:

Pursuant to the Commission's *Secondary Markets* policies, Sirius XM Radio Inc. ("Sirius XM") requests that the Commission terminate or suspend the spectrum leases to T-Mobile from AT&T described in the above-captioned lease notifications (collectively, the "Lease Arrangements"). For the reasons discussed below, Sirius XM requests that the Commission exercise its authority to investigate and terminate the Lease Arrangements in light of the manifest public interest harms that would flow from T-Mobile's use of additional spectrum resources covered by the Lease Arrangements in a manner that is likely to cause harmful interference to the Sirius XM service.¹ In the alternative, Sirius XM requests that the Commission stay the effectiveness of the Lease Arrangements until it completes a full investigation of the public interest concerns raised by T-Mobile's planned operations.²

¹ See *Promoting Efficient Use of Spectrum Through Elimination of Barriers to the Development of Secondary Markets*, Report and Order, 18 FCC Rcd 20604, at ¶ 125 (2003).

² See *Promoting Efficient Use of Spectrum Through Elimination of Barriers to the Development of Secondary Markets*, Second Report and Order, 19 FCC Rcd 17503, at ¶ 135 (2004) (an interested party may seek a formal determination from the Commission regarding particular spectrum manager leases by means of a letter, and "[t]o the extent the Bureau determines that the leasing arrangement may raise potential public interest concerns . . . it will take whatever steps it deems appropriate to investigate or address those concerns, including notifying the licensee and possibly requiring that parties not commence operations under the lease until such concerns have been resolved.").

The Lease Arrangements would provide T-Mobile with access to additional spectrum resources in the AWS-1 and PCS bands, as a precursor to a spectrum “swap” that the parties apparently intend to effect in the near future. T-Mobile asserts that these transactions would facilitate T-Mobile’s deployment of its 4G LTE network by “creating larger blocks of contiguous spectrum and aligning spectrum blocks across markets.”³ This is the sole public interest benefit claimed by T-Mobile.

Sirius XM submits this request to highlight the substantial public interest *harms* that would result from allowing the Lease Arrangements to proceed. Namely, the further deployment of T-Mobile’s 4G LTE network on the AWS-1 spectrum covered by the Lease Arrangements would risk causing significant harmful interference to the Sirius XM service (and similar issues could arise in connection with T-Mobile’s use of the PCS spectrum covered by the Lease Arrangements). As Sirius XM has explained, T-Mobile’s 4G LTE network is currently causing such harmful interference in certain markets, and T-Mobile’s use of the spectrum covered by the Lease Arrangements in a similar manner likely would cause further harmful interference in additional areas.⁴ T-Mobile has conceded as much; in response to Sirius XM’s attempts to ascertain the potential for the same type of harmful interference to occur in additional markets, T-Mobile has: (i) directed Sirius XM to “assume that that [sic] we [T-Mobile] will be deploying LTE in areas where we hold spectrum;” (ii) acknowledged that Sirius XM receivers could experience harmful interference in those areas as a result of T-Mobile’s new AWS-1 deployment; and (iii) sought to abdicate responsibility for mitigating the harmful interference T-Mobile is and will be causing.⁵

Notably, the Lease Arrangements and the related spectrum “swap” between the parties raise the same public interest concerns that have been documented extensively in connection with a separate proposed spectrum “swap” involving T-Mobile and Verizon.⁶ In objecting to that swap, Sirius XM identified numerous substantial and material questions of fact, including whether: (i) T-Mobile’s proposed operations would serve the public interest in light of the additional harmful interference that likely would result and (ii) T-Mobile’s failure to satisfy its obligations as an AWS licensee to mitigate such harmful interference demonstrates that it lacks the character qualifications necessary to obtain additional Commission licenses or spectrum rights. Virtually identical substantial and material questions of fact arise in connection with the Lease Arrangements. Accordingly, Sirius XM incorporates by reference into the record of this

³ See ULS File No. 0006972875, Public Interest Statement, at 1 (filed Oct. 6, 2015) (“Lease Notification Narrative”).

⁴ See Objection of Sirius XM Radio Inc., ULS File Nos. 0006867447 *et al.* (Aug. 11, 2015), attached as Exhibit 1 hereto (“Objection”); Consolidated Reply of Sirius XM Radio Inc., ULS File Nos. 0006867447 *et al.* (Sep. 11, 2015), attached as Exhibit 2 hereto (“Reply”).

⁵ See E-Mail from Steve Sharkey, T-Mobile, to Terrence Smith, Sirius XM (July 10, 2015).

⁶ See generally Objection and Reply.

proceeding the Objection, its Reply, and each of its other submissions in T-Mobile-Verizon swap proceeding.⁷

The legitimacy of the public interest concerns Sirius XM raised in the Objection is underscored by recent developments. *First*, the Commission has determined that the public interest *requires* altering default *ex parte* procedures in the T-Mobile-Verizon swap proceeding to facilitate a fulsome exploration of those concerns.⁸ Because the Lease Arrangements and the broader spectrum swap contemplated by T-Mobile and AT&T raise the same concerns, the public interest also *requires* the Commission to investigate those concerns thoroughly as well in the context of this proceeding.

Second, T-Mobile recently altered its basis for opposing Sirius XM's Objection and, in doing so, tacitly conceded that it is appropriate for the Commission to evaluate whether allowing T-Mobile access to additional spectrum rights in specific markets would cause additional harmful interference to Sirius XM. As noted above, T-Mobile has acknowledged that the nationwide implementation of its 4G LTE network could cause harmful interference to Sirius XM in all affected markets. Nevertheless, T-Mobile initially maintained (in its Response to the Objection) that the resulting public interest harms identified by Sirius XM somehow were not "transaction-specific" because those harms allegedly would result even in the absence of the proposed T-Mobile-Verizon swap, and allegedly would not be T-Mobile's responsibility in any event.⁹ In its Reply, Sirius XM demonstrated the inherent weakness of that position through detailed technical analysis, reliance on established Commission precedent, and common sense.¹⁰

T-Mobile then changed its story. For the first time, T-Mobile asserted in a Sur-Reply that Sirius XM's concerns were not "transaction-specific" because Sirius XM allegedly "failed to demonstrate that the types of high density deployments which it finds objectionable in midtown Manhattan could occur and cause muting conditions inside Sirius XM receivers in the much less densely populated markets involved in this transaction."¹¹ Notably, T-Mobile provides no substantiation whatsoever for this assertion, which has no basis in the record of that proceeding

⁷ See, e.g., *id.*

⁸ See *Commission Modifies Ex Parte Status for Proposed Exchange of Licenses Between Cellco Partnership d/b/a Verizon Wireless and T-Mobile License LLC*, DA 15-1066 (Sep. 23, 2015).

⁹ See T-Mobile Response to Objection of Sirius XM Radio, Inc. and Motion to Dismiss, ULS File Nos. 0006867447 *et al.*, at 9-11 (Aug. 26, 2015).

¹⁰ See, e.g., Reply at 15-18 (demonstrating that the proposed "swap" would increase the potential for harmful interference into Sirius XM's service) & Exhibit 3 (Declaration of Dr. Michael J. Marcus).

¹¹ See Sur-Reply of T-Mobile USA, Inc. to Reply of Sirius XM Radio Inc., ULS File Nos. 0006867447 *et al.*, at 10 (Oct. 2, 2015).

and ignores the fact that the licenses that are the subject of the T-Mobile-Verizon swap include coverage of urban areas.¹²

But T-Mobile's new line of argument is significant because it concedes that Sirius XM's concerns *are* cognizable in the context of individual transactions where the "right" set of facts exist. T-Mobile claims that those types of facts do not exist in connection with the T-Mobile-Verizon swap (*e.g.*, T-Mobile alleges that its use of AWS-1 spectrum in Cincinnati, Ohio will be fundamentally different than its current operations in the New York metropolitan area and other areas already suffering harmful interference from T-Mobile's operations). That assertion is counterintuitive, but in any event highlights just one of the many substantial and material questions in that context that must be resolved in this proceeding—*i.e.*, why T-Mobile's operations recently have begun to cause harmful interference to Sirius XM's service.

At bottom, T-Mobile's stated plans to use the Lease Arrangements, and the AWS-1 spectrum rights conferred thereby, to facilitate its 4G LTE deployment in such major urban centers as Phoenix, San Antonio, Austin, Boston, and Minneapolis-St. Paul raise the same types of concerns at issue in the context of the T-Mobile-Verizon spectrum swap. As in that context, the public interest concerns raised by Sirius XM in this letter are "transaction-specific" because: (i) the relevant harms would not be realized from the band segments at issue absent T-Mobile's use of the additional spectrum resources it seeks to access through the Lease Arrangements; and (ii) those harms would be avoided entirely if the Commission were to block such access. For these reasons, Sirius XM reiterates its request that the Commission exercise its authority to investigate and terminate, or stay, the Lease Arrangements given the manifest public interest concerns they raise.

¹² T-Mobile has not substantiated how its AWS-1 deployment in the New York metropolitan area is technically or operationally different from its planned AWS-1 deployment in other markets. Moreover, the T-Mobile-Verizon "swap" involves urban areas including Cincinnati, Ohio and Norfolk, Virginia. The Lease Arrangements and the broader T-Mobile-AT&T "swap" involve an even larger number of urban areas, including in eight of the 50 largest cities in the United States by population based on 2010 Census figures (Phoenix, Arizona (#6); San Antonio, Texas (#7); Austin, Texas (#14); Boston, Massachusetts (#22); Tucson, Arizona (#33); Sacramento, California (#35); Tulsa, Oklahoma (#46); and Minneapolis-St. Paul, Minnesota (#48)).

Respectfully submitted,

/s/ John P. Janka

John P. Janka
Jarrett S. Taubman

Counsel to Sirius XM Radio Inc.

cc: Julius Knapp (via e-mail)
Mindel De La Torre (via e-mail)
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Scott Patrick (via e-mail)
Linda Ray (via e-mail)
Michael P. Goggin, AT&T
Kathleen O'Brien Ham, T-Mobile
Steve Sharkey, T-Mobile
Doane F. Kiechel, Kiechel Law
Trey Hanbury, Hogan Lovells US LLP
Sara Trosch, Verizon

EXHIBIT 1

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

In the Matter of)	
)	
Assignment Applications of	)	ULS File Nos. Listed In Exhibit 1
T-Mobile License LLC and)	
Cellco Partnership d/b/a/ Verizon Wireless)	
and Certain of Its Subsidiaries)	

OBJECTION OF SIRIUS XM RADIO INC.

Sirius XM Radio Inc. (“SiriusXM”) objects to grant of the assignment applications filed on July 17, 2015 (collectively, the “Application”) by T-Mobile License LLC (“T-Mobile”) and Cellco Partnership d/b/a/ Verizon Wireless and certain of its subsidiaries (collectively “Verizon” and, together with T-Mobile, the “Applicants”), which seek authority to “swap” certain Advanced Wireless Services (“AWS”) and Personal Communications Service (“PCS”) spectrum currently held by the Applicants.¹ As explained below, T-Mobile’s recent actions relating to current and planned use of its AWS spectrum raise substantial and material questions of fact that preclude grant of the Application. More specifically, T-Mobile’s practice of knowingly using its AWS licenses in a manner that causes harmful interference to other authorized spectrum users calls into question whether T-Mobile will use the spectrum rights it will acquire through the proposed transactions in a manner that serves the public interest. Moreover, T-Mobile’s practice of causing harmful interference and ignoring its obligations to

¹ A complete list of the Applications is set forth in Exhibit 1 hereto.

mitigate that interference raises questions as to T-Mobile's character qualifications.

Accordingly, the Application should be denied or designated for a hearing.²

I. BACKGROUND

SiriusXM provides audio programming services to over 28 million subscribers and plays an important role in the national media and the exchange of diverse content and viewpoints. SiriusXM also plays a key role in the dissemination of emergency alerts and in providing other weather and public safety-related information both to its subscribers and to non-subscribers with satellite radios. Subscribers access the company's satellite radio services through a variety of radiofrequency ("RF") receivers, including those factory-installed in vehicles manufactured by every major car company in the U.S. In fact, SiriusXM receivers are installed in approximately seventy percent of all new cars, and have been installed in an estimated seventy million vehicles on the road today.

SiriusXM subscribers have recently begun experiencing harmful interference to their satellite radio reception in select large urban markets. This interference—which can be severe, completely blocking reception of the service—became noticeable only after T-Mobile deployed its AWS network in those markets. Through initial testing, SiriusXM identified T-Mobile AWS base stations as the primary contributors to this interference, because they

² While at one time it appeared that a meeting to discuss the interference T-Mobile is causing would be held around the time the Application came off public notice, this no longer appears to be the case. SiriusXM submits this Objection at the earliest possible time thereafter, and before the anticipated date of initial Commission action with respect to the Application. 47 C.F.R. § 1.948(j)(1)(iv). The Commission will consider informal objections of this type where the public interest warrants it. *See, e.g., AT&T Inc. and DIRECTV*, MB Docket No. 14-90, FCC 15-94 ¶ 31 n.90 (2015); *Wireless Telecommunications, Inc.*, 24 FCC Rcd 3162, at ¶ 11 (2009); *see also* 47 C.F.R. § 1.41 (allowing parties to file informal objections).

produce extremely high power-density levels at the street level.³ These power-density levels are as much as 14 dB greater than those produced by other wireless carriers in AWS or any other spectrum bands used for mobile broadband service. Unless remedied, this interference problem will worsen as T-Mobile continues to implement its AWS network by constructing and activating facilities in additional markets, likely including facilities in the service areas and using the frequencies covered by the licenses at issue in the Application.

SiriusXM has raised these interference concerns with both T-Mobile and the Commission, explaining that SiriusXM receivers function properly and without interference throughout the continental United States, except in the vicinity of certain T-Mobile AWS base stations. SiriusXM also has emphasized that Commission rules and policies obligate T-Mobile to remedy this issue. In particular, Section 27.64 of the Commission's rules: (i) explicitly directs AWS licensees to resolve incidents of harmful interference through technical means or by negotiating appropriate operating arrangements; (ii) establishes that AWS licensees have a general duty to mitigate harmful interference—even where caused by operations that appear to comply with the Commission's prophylactic service rules; and (iii) authorizes the Commission to modify AWS licenses where "rule-compliant" operations cause such interference.⁴

Although SiriusXM has produced clear evidence showing that T-Mobile's operations cause harmful interference to SiriusXM subscribers, T-Mobile has refused to mitigate

³ Intermodulation occurs when more than one signal is present at a non-linear device and each signal acts as a mixer, generating new frequencies that are mathematical combinations of the two transmitting frequencies. Each intermodulation component that falls into another band elevates the noise floor of that band. In this case, certain AWS and PCS frequencies licensed to T-Mobile create intermodulation interference into satellite radio receivers resulting in muting, preventing any reception of the satellite radio signal.

⁴ 47 C.F.R. § 27.64.

this interference or enter into *bona fide* discussions to explore in good faith mutually acceptable technical solutions. Furthermore, T-Mobile has refused to conduct appropriate tests—or even to provide technical information to SiriusXM—to facilitate the ability of SiriusXM or the Commission to conduct further technical analysis and develop potential mitigation solutions. T-Mobile also has refused to test or even discuss possible solutions in those markets where its AWS network is not yet deployed. Indeed, T-Mobile has flatly refused to take *any* action that potentially could impact its own network—contrary to its clear obligations as a Commission licensee. Instead, T-Mobile has sought to abdicate all responsibility for addressing the harmful interference it is creating, and instead has attempted to shift the blame onto SiriusXM—even though SiriusXM’s receivers are designed to perform better than 3GPP standards (including with respect to out-of-band signal tolerance), and even though the SiriusXM network has successfully operated for almost fifteen years (prior to T-Mobile’s AWS deployment) in the vicinity of mobile wireless base stations without any significant issue.

II. DISCUSSION

Section 310(d) of the Communications Act, as amended, provides that no license may be assigned unless the Commission affirmatively finds that the public interest, convenience, and necessity will be served thereby.⁵ Applicants bear the burden of proving, by a preponderance of the evidence, that the proposed transaction, on balance, serves the public interest.⁶ If the Commission is unable to determine that the proposed transaction serves the public interest for

⁵ 47 U.S.C. § 310(d).

⁶ See, e.g., *AT&T Inc., Leap Wireless International, Inc., Cricket License Co., LLC and Leap LicenseCo, Inc.*, 29 FCC Rcd 2735, at ¶ 13 (2014); *Sprint Nextel Corp. and SoftBank Corp. and Starburst II, Inc.*, 28 FCC Rcd 9642, at ¶ 23 (2013); *Deutsche Telekom AG, T-Mobile USA, Inc., and MetroPCS Communications, Inc.*, 28 FCC Rcd 2322, at ¶ 14 (2013).

any reason, or if the record presents a substantial and material question of fact, Section 309(e) of the Act requires that the application be designated for a hearing.⁷

A. T-Mobile’s Practice of Causing Harmful Interference Raises Questions as to Whether the Proposed Transactions Would Serve the Public Interest

In evaluating any proposed assignment under Section 310(d) of the Act, the Commission must weigh the potential public interest harms of the proposed transaction against the potential public interest benefits.⁸ Among other things, the Commission must assess whether a proposed transaction would facilitate conduct inconsistent with established Commission policy or adversely affect the diversity and quality of existing communications services, including but not limited to broadcast services. Notably, it has long been a basic tenet of national communications policy that “the widest possible dissemination of information from diverse and antagonistic sources is essential to the welfare of the public.”⁹

In light of T-Mobile’s recent conduct, grant of the Application demonstrably would *not* serve the public interest, convenience and necessity. At a minimum, substantial and material questions of fact exist that are relevant to assessing the asserted benefits, and that also bear on the likely harms, of the proposed transactions. Thus, under Section 310(d) of the Act, the Commission cannot grant the Application at this time.

In evaluating the Application, the Commission must balance the public interest harms that would flow from the proposed transactions—including but not limited to an increased

⁷ 47 U.S.C. § 309(e).

⁸ *See, e.g., EchoStar Communications Corporation, General Motors Corporation, and Hughes Electronics Corporation and EchoStar Communications Corporation*, Hearing Designation Order, 17 FCC Rcd 20559, at ¶ 25 (2002) (“*EchoStar-DIRECTV HDO*”).

⁹ *Turner Broadcasting System, Inc. v. FCC*, 512 U.S. 622, 663-664 (1994) (quoting *U.S. v. Midwest Video Corp.*, 406 U.S. 649, 668, n. 27 (1972) (plurality opinion) (quoting *Associated Press v. U.S.*, 326 U.S. 1, 20 (1945))).

risk of harmful interference to satellite radio operations—against any potential public interest benefits. The harms flowing from these transactions would further undermine SiriusXM’s ability to operate as it is licensed to operate, and as its millions of subscribers expect it to operate, and could result in the loss of revenues and other business opportunities. These harms would flow directly from grant of the Application.

More specifically, it is likely that grant of the Application would exacerbate the adverse effects of T-Mobile’s existing noncompliance, facilitate additional noncompliance, and otherwise harm the public interest.¹⁰ In light of T-Mobile’s recent pattern of reticence and legal noncompliance, facilitating T-Mobile’s continued buildout of AWS frequencies by making that buildout more “efficient”¹¹ also would facilitate T-Mobile’s ability to create harmful interference to SiriusXM and its subscribers, including in additional markets that may not currently be receiving interference from T-Mobile’s AWS operations. Notably, the proposed transactions would facilitate T-Mobile’s ability to implement the very type of AWS deployment that is causing harmful interference today.¹²

SiriusXM plays an important role in the national media and the exchange of diverse content and viewpoints. T-Mobile’s AWS wireless network deployments threaten SiriusXM’s ability to serve in this capacity, as well as SiriusXM’s continued ability to provide emergency alerts and other public safety-related information. Further T-Mobile deployments

¹⁰ The Commission should require T-Mobile to explain in detail whether the license “swaps” requested in the Application would exacerbate the interference T-Mobile is causing to SiriusXM. The limited availability of public information describing where and how T-Mobile operates its AWS and PCS transmitters, coupled with T-Mobile’s refusal to disclose this information, severely restricts SiriusXM’s ability to perform its own analysis of the impact of the specific “swaps” at issue.

¹¹ Application Narrative at 5.

¹² *Id.*

consequently threaten to undermine the Commission's policy to ensure widest possible dissemination of information from diverse and antagonistic sources, and thus serve the public interest. Accordingly, the Commission cannot and should not grant the Application.

B. T-Mobile's Practice of Causing Harmful Interference and Ignoring Its Obligations To Mitigate that Interference Raises Questions as to T-Mobile's Character Qualifications

Among the factors the Commission considers in its public interest review is whether an applicant has the requisite "citizenship, character, and financial, technical, and other qualifications."¹³ As a threshold matter, the Commission must determine whether the applicants meet the requisite qualifications and requirements to hold and assign licenses under Section 310(d) and the Commission's rules.¹⁴ With respect to Commission-related conduct, the Commission has stated, in its *Character Policy Statement* and elsewhere, that all violations of the Act, or of the Commission's rules or policies, are predictive of an applicant's future conduct, truthfulness and reliability, and thus have a bearing on an applicant's character qualifications.¹⁵

T-Mobile's noncompliance with Commission rules indicates that it lacks the requisite character qualifications to assign, or be assigned, the licenses at issue. As noted above,

¹³ 47 U.S.C. §§ 308, 310(d).

¹⁴ See 47 U.S.C. § 310(d); see also *Comcast Corp., General Electric Co. and NBC Universal, Inc.*, 26 FCC Rcd 4238, at ¶ 276 (2011) ("*Comcast-NBCU Order*"); *General Motors Corp. and Hughes Electronics Corp., and News Corporation*, 19 FCC Rcd 473, at ¶ 18 (2004) ("*News Corp.-Hughes Order*"); *EchoStar-DIRECTV HDO* ¶ 28.

¹⁵ See *Character Qualifications in Broadcast Licensing*, 102 FCC.2d 1179, at ¶ 57 (1986) ("[W]e find it appropriate and sufficient to treat any violation of any provision of the Act, or of our Rules or policies, as possibly predictive of future conduct and, thus, as possibly raising concerns over the licensee's future truthfulness and reliability, without further differentiation"); see also, e.g., *Cellco Partnership d/b/a Verizon Wireless and Atlantis Holdings LLC*, 23 FCC Rcd 17444, at ¶ 32 (2008). The Commission uses its character policy in the broadcast area as guidance in resolving similar questions in transfer of common carrier authorization and other license transfer proceedings. *MCI Telecommunications Corp.*, 3 FCC Rcd 509, 515 n.14 (1988).

T-Mobile's existing AWS operations are causing harmful interference to SiriusXM's satellite-delivered service in several urban markets. T-Mobile is aware of this interference but refuses to take any action to address or mitigate it. Furthermore, T-Mobile refuses even to take actions that might allow SiriusXM or the Commission to more fully evaluate the nature of the interference and develop technical solutions to address it.

As a Commission licensee, T-Mobile is fully aware of its obligations to mitigate this interference under the Commission's rules generally and Section 27.64 specifically. Notwithstanding such knowledge, T-Mobile has chosen to willfully ignore those obligations at the expense of SiriusXM and its subscribers. This pattern of knowing noncompliance and disregard for its obligations strongly suggests that T-Mobile lacks the requisite character qualifications to serve as a Commission licensee. Accordingly, the Commission cannot and should not grant the Applications.

* * * * *

As discussed above, T-Mobile has established a pattern of using its AWS licenses to cause interference into other authorized spectrum users and ignoring its obligations as a Commission licensee to mitigate that interference. This conduct demonstrates that grant of the Application would not serve the public interest, convenience and necessity. At a minimum, substantial and material questions of fact exist that are relevant to an assessment of the asserted benefits, and that also bear on the likely harms, of the proposed transactions. For these reasons, the Application should be denied or designated for a hearing.

Respectfully submitted,

/s/ John P. Janka

John P. Janka

Jarrett S. Taubman

LATHAM & WATKINS LLP

555 Eleventh Street, NW, Suite 1000

Washington, DC 20004

Counsel to Sirius XM Radio Inc.

August 11, 2015

DECLARATION

I, Terrence Smith, hereby make the following declarations under penalty of perjury. I understand that this Declaration will be submitted to the Federal Communications Commission.

1. I am Corporate Vice President and Chief Engineering Officer of Sirius XM Radio Inc.
2. I have reviewed the foregoing Objection of Sirius XM Radio Inc. and the information contained therein is true and correct to the best of my knowledge, information and belief.



Terrence Smith

Executed August 11, 2015

Exhibit 1

File Number	Assignor	Assignee	Call Sign(s)
0006868438	T-Mobile License LLC	Cellco Partnership	KNLG370, KNLG399, WQCX694, WQGB362, WQGD474, WQGD616, WQJF365, WQPZ994, WQPZ999
0006868544	T-Mobile License LLC	Cellco Partnership	WQGA731, WQGB363, WQGB376, WQGB377, WQGB378, WQGD585, WQKF358
0006867476	T-Mobile License LLC	Fresno MSA Limited Partnership	KNLG354
0006867520	T-Mobile License LLC	GTE Mobilnet of California Limited Partnership	KNLF565
0006867447	T-Mobile License LLC	GTE Wireless of the Midwest Incorporated	KNLG706, KNLF900
0006867467	T-Mobile License LLC	GTE Mobilnet of Indiana RSA #6 Limited Partnership	KNLG706
0006867470	T-Mobile License LLC	GTE Wireless of the Midwest Incorporated	KNLG800
0006867545	T-Mobile License LLC	Verizon Wireless Personal Communications LP	KNLF964
0006867559	T-Mobile License LLC	Verizon Wireless Personal Communications LP	KNLG239
0006868798	Cellco Partnership	T-Mobile License LLC	KNLG206, KNLG754, KNLG829, WQEM929
0006869754	Cellco Partnership	T-Mobile License LLC	WQGA715, WQGA717, WQGA718, WQGB383, WQGB384, WQGB385, WQPW449, WQPZ950
0006869768	Fresno MSA Limited Partnership	T-Mobile License LLC	KNLH441
0006869777	GTE Mobilnet of California Limited Partnership	T-Mobile License LLC	KNLG359
0006869790	GTE Mobilnet of Indiana RSA #6 Limited Partnership	T-Mobile License LLC	WQOQ729
0006869871	GTE Wireless of the Midwest Incorporated	T-Mobile License LLC	WPQN807
0006869873	Verizon Wireless Personal Communications LP	T-Mobile License LLC	KNLF246

CERTIFICATE OF SERVICE

I, Jarrett S. Taubman, hereby certify that on this 11th day of August, 2015, I caused a true and correct copy of the foregoing “Objection of Sirius XM Radio Inc.” to be served upon the following, via first-class mail, postage prepaid:

T-Mobile License LLC
Attn: FCC Regulatory Compliance
12920 SE 38th Street
Bellevue, WA 98006

Sarah Trosch
Verizon
1300 I Street, NW - Suite 400 West
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Doane F. Kiechel
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445 12th Street, SW
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* Delivered via electronic mail

/s/ Jarrett S. Taubman
Jarrett S. Taubman

EXHIBIT 2

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

In the Matter of	) ULS File Nos. 0006867447, 0006868438,
	) 0006868544, 0006867476, 0006867520,
Assignment Applications of	) 0006867467, 0006867470, 0006867545,
T-Mobile License LLC and	) 0006867559, 0006868798, 0006869754,
Cellco Partnership d/b/a Verizon Wireless	) 0006869768, 0006869777, 0006869790,
and Certain of Its Subsidiaries	) 0006869871, and 0006869873

CONSOLIDATED REPLY OF SIRIUS XM RADIO INC.

John P. Janka
Jarrett S. Taubman
LATHAM & WATKINS LLP
555 Eleventh Street, NW, Suite 1000
Washington, DC 20004

Counsel to Sirius XM Radio Inc.

September 11, 2015

Summary

In this Consolidated Reply, Sirius XM further explains why the Commission should deny or designate for hearing the applications of T-Mobile and Verizon to “swap” AWS and PCS spectrum rights in a number of markets (collectively, the “Application”). The informal objection filed by Sirius XM on August 11, 2015 (the “Objection”) established that:

- (i) T-Mobile uses its existing AWS spectrum rights in a manner that causes harmful interference to Sirius XM and its subscribers and harms the public interest—*joint testing confirmed that the interference ceased when T-Mobile’s AWS carrier was turned off*;
- (ii) T-Mobile willfully ignores its obligation to mitigate that harmful interference, as well as its specific obligations under Section 27.64 of the Commission’s rules to use technical means to resolve that interference; and
- (iii) T-Mobile’s conduct strongly suggests that T-Mobile: (1) would use *additional* spectrum rights obtained through the Application to cause *additional* harmful interference to the Sirius XM service in *additional* markets—resulting in *additional* public interest harms; and (2) lacks the character qualifications necessary to obtain these additional Commission licenses.

Neither T-Mobile nor Verizon disputes that Sirius XM is suffering harmful interference, that transmissions from T-Mobile’s network are causing that interference, or that placing additional AWS licenses in the hands of T-Mobile would facilitate additional harmful interference. Moreover, neither Applicant even *attempts* to demonstrate that the claimed benefits of the proposed transaction outweigh the public interest harms that Sirius XM has identified. To the contrary, T-Mobile’s Response actually *confirms* the existence of substantial and material questions of fact that bear directly on the Commission’s public interest analysis.

T-Mobile attempts to shirk its obligations as a licensee by characterizing the harmful interference it causes to Sirius XM as a “receiver problem” to be addressed solely by Sirius XM. That position ignores: (i) decades of Commission precedent establishing that such intermodulation interference constitutes legally cognizable “harmful interference” that must be

mitigated by the transmitting party; (ii) the plain language of Section 27.64 of the Rules, which directs AWS licensees to address intermodulation interference through technical means and expressly distinguishes intermodulation interference from *other* types of interference from which receivers are *not* entitled to protection; and (iii) evidence demonstrating that Sirius XM receivers were properly engineered to reject PCS and AWS signals that could be reasonably expected, based on 3GPP standards. Moreover, although both Applicants urge the Commission to ignore existing and future harmful interference to Sirius XM and its subscribers because they claim that the public interest harms Sirius XM identified are not “transaction-specific,” that position is illogical; those harms would flow directly from the consummation of the proposed transaction, using many of the licenses and in the very markets identified in the Application.

This Consolidated Reply includes two declarations of technical experts (Dr. Michael J. Marcus of Marcus Spectrum Solutions and Terrence Smith of Sirius XM) who describe the history of this harmful interference and the efforts to resolve it, discuss Commission history and rules with reference to intermodulation interference, and provide supporting technical information relating to this matter. Sirius XM also includes point-by-point rebuttals to the many inaccuracies and half-truths contained in T-Mobile’s Response. This information, provided in Response to T-Mobile’s pleading, confirms the many substantial and material questions of fact that the Commission must resolve before it can act on the Application.

The weakness of T-Mobile’s position is further underscored by its request that the Commission treat Sirius XM’s Objection as an untimely “petition to deny” and summarily dismiss it, even though:

- Sirius XM filed its pleading as an informal objection, not as a petition to deny;
- Commission rules and precedent allow the filing of informal objections to inform the Commission's public interest analysis;
- The Commission's statutory public interest mandate requires careful and thorough consideration of the issues that Sirius XM has raised;
- Sirius XM has demonstrated that granting the Application would harm its service and the public interest; and
- Sirius XM refrained from opposing the Application (through a petition to deny) based on then-ongoing efforts of Commission staff to facilitate a resolution of the harmful interference.

Equally misguided is T-Mobile's request that the Commission sanction Sirius XM for advocating legal positions contrary to T-Mobile's interests, even though those positions: (i) are grounded in unambiguous Commission precedent; (ii) are consistent with the Commission's efforts to facilitate mitigation of the harmful interference caused by T-Mobile; and (iii) previously were articulated before the Commission both by T-Mobile's chief engineer and by its outside counsel in other proceedings.

Granting the Application would not serve the public interest, convenience or necessity. In sum, the record establishes that: (i) T-Mobile is using its existing AWS licenses to cause harmful interference to Sirius XM, which, if left unchecked, will dramatically increase over time; (ii) the transactions proposed in the Application would facilitate additional such interference in new markets; and (iii) T-Mobile has ignored its obligations as a Commission licensee to mitigate that harmful interference. At a minimum, substantial and material questions of fact exist that bear directly on the required public interest analysis. For these reasons, Sirius XM reiterates that the Application either should be denied or should be designated for a hearing.

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

In the Matter of) ULS File Nos. 0006867447, 0006868438,
	) 0006868544, 0006867476, 0006867520,
Assignment Applications of	) 0006867467, 0006867470, 0006867545,
T-Mobile License LLC and	) 0006867559, 0006868798, 0006869754,
Cellco Partnership d/b/a Verizon Wireless	) 0006869768, 0006869777, 0006869790,
and Certain of Its Subsidiaries	) 0006869871, and 0006869873

CONSOLIDATED REPLY OF SIRIUS XM RADIO INC.

Sirius XM Radio Inc. (“Sirius XM”) replies to the Response submitted by T-Mobile License LLC (“T-Mobile”) on August 26, 2015 in this proceeding (the “Response”).¹ Sirius XM also replies to the brief letter submitted by Cellco Partnership d/b/a Verizon Wireless and certain of its subsidiaries (collectively “Verizon” and, together with T-Mobile, the “Applicants”) on that same date, which reiterates a very narrow subset of the arguments made in the Response. Both of the submissions concern the informal objection filed by Sirius XM on August 11, 2015 (the “Objection”), which opposes a series of applications (collectively, the “Application”) in which the Applicants request Commission consent to “swap” Advanced Wireless Service (“AWS”) and Personal Communications Service (“PCS”) spectrum rights held by the Applicants in certain markets (collectively, the “Proposed Transaction”).

In the Objection, Sirius XM established that T-Mobile’s recent actions relating to current and planned use of its AWS spectrum—including its knowing use of licensed AWS facilities in a manner that causes harmful interference to Sirius XM—raise substantial and material questions of fact that preclude grant of the Application. Nothing in T-Mobile’s Response or Verizon’s

¹ The pagination in the redacted version of the Response is not identical to the pagination in the confidential version of the Response. Citations to the Response included herein refer to confidential version (and the pagination scheme thereof).

separate letter denies that T-Mobile has caused harmful interference to Sirius XM or would cause additional harmful interference if the Proposed Transaction is allowed to proceed. The Response in fact *confirms* the existence of substantial and material questions of fact that would need to be resolved before the Commission could act on the Application. Accordingly, Sirius XM reiterates that the Application should be denied or designated for a hearing.

I. BACKGROUND

The Application and Sirius XM's Objection arise in a specific factual context that must be understood to appreciate why the Proposed Transaction would harm the public interest.

A. Initial Investigation of Harmful Interference and Identification of T-Mobile as the Cause

As noted in the Objection, Sirius XM recently has observed significant harmful interference to satellite radio reception in select large urban markets. This interference—which can be severe, completely blocking reception of the service—became noticeable only after T-Mobile deployed its AWS network in those markets. Following reports of such interference, Sirius XM commenced an investigation into the causes. Through this initial testing, Sirius XM confirmed the reported interference and determined that the resulting disruptions to its service were alarmingly severe, extensive and frequent.

Given the absence of material and recent changes in the Sirius XM network, testing focused on changes in the radio frequency environment in the affected areas, including those related to the provision of AWS and PCS wireless service. More specifically, Sirius XM used spectral mapping equipment to identify areas with very strong AWS and PCS on-ground signals.

Sirius XM suspected that these signals might be creating intermodulation interference into Sirius XM receivers.²

Among other things, Sirius XM engineers measured the strength, at street level, of wireless base station emissions in certain frequency bands licensed to T-Mobile in the New York metropolitan area. The measured power levels on the street around the base stations operating in these bands were extremely high—as much as 40 to 100 times higher than those in the 3GPP specification for 4G LTE operations.³ Moreover, these power levels were appreciably higher than those measured on frequencies licensed to other wireless carriers. In fact, the extreme variability in power levels measured across T-Mobile sites appears unprecedented in the industry.⁴

² As explained in the Declaration of Dr. Michael J. Marcus, attached hereto (the “Marcus Declaration”), intermodulation interference is caused when two strong signals transmitted at certain frequencies interact to create a new signal that is within the same frequency band as the desired signal of a given receiver (*i.e.*, is co-channel to that desired signal). Intermodulation interference occurs only where three conditions simultaneously exist: (i) a certain mathematical combination of transmit frequencies exists; (ii) transmissions at one of both such frequencies have a high signal strength; and (iii) the combination of the signals on those transmit frequencies adversely affects the intended performance of the receiver. *See* Marcus Declaration ¶ 5.

³ The 3rd Generation Partnership Project (3GPP), a group of national and regional standards bodies, establishes standards that, among other things, describe the maximum signal strength at which 4G LTE base stations normally can be expected to operate, and inform recommendations as to the 4G LTE signal strengths that receivers should be able to tolerate. *See, e.g., National Instruments, Introduction to LTE Device Testing -From Theory To Transmitter and Receiver Measurements*, at 63, available at http://download.ni.com/evaluation/rf/Introduction_to_LTE_Device_Testing.pdf (last visited Sep. 6, 2015); S. Sesia, et al., *LTE – THE UMTS LONG TERM EVOLUTION FROM THEORY TO PRACTICE* 491 (2d Ed. 2011); *see also* Marcus Declaration ¶ 12.

⁴ *Id.* ¶ 22. T-Mobile antennas are located at relatively low elevations (*i.e.*, on top of one-story buildings) and operate at extremely high transmit power levels. The combination contributes to the observed interference. *See id.* ¶ 16 (showing a picture of one such T-Mobile base station in New York City).

Based on these considerations (and others described in the attached Declaration of Terrence Smith (the “Smith Declaration”)), the investigation identified intermodulation interference arising from T-Mobile’s AWS operations as the primary source of the disruption to the Sirius XM service. Although it is not clear what aspect of T-Mobile’s wireless network may be causing this harmful interference today (*e.g.*, recent network changes), it is clear that: (i) this interference was not an issue several years ago when Sirius XM conducted drive tests to measure the reliability of its service; (ii) this interference is an issue now; and (iii) the interference ceases when the T-Mobile’s AWS signal at the relevant base station is not transmitting.⁵

B. Testing Confirms T-Mobile as the Cause of the Harmful Interference Suffered by Sirius XM

Following the initial investigation described above, Sirius XM approached T-Mobile to discuss conducting joint tests to gather additional information relevant to the analysis of the ongoing harmful interference suffered by Sirius XM and possible ways to resolve it. In January 2015, Sirius XM performed tests with T-Mobile engineers at selected T-Mobile base stations in the New York metropolitan area to measure the effects on the Sirius XM service of turning on and off T-Mobile’s AWS and PCS signals. The testing determined that the strong wireless signals from T-Mobile’s base stations were the major source of disruption to the Sirius XM

⁵ T-Mobile does not dispute any of this, but rather claims that this interference started occurring before T-Mobile rolled out its LTE service in the New York metropolitan area. Response at 14. Even if that were the case, it does not absolve T-Mobile of responsibility. Moreover, T-Mobile’s Response begs the question of what other changes it has made in its network operations over the past few years, such as changes in power levels, changes in antennas/antenna orientation, and changes in the number or location of base stations. Notably, the harmful interference from T-Mobile’s network seems to be driven by intense use of AWS spectrum at high power levels, particularly during peak network traffic periods. *See* Smith Declaration ¶¶ 16, 20-21.

service. Significantly, whenever the T-Mobile AWS signal was turned off, that disruption disappeared—even when the T-Mobile PCS signal was still operating.⁶

Based on these results, Sirius XM concluded that T-Mobile’s high-powered AWS signal was the primary source of the harmful interference to the Sirius XM service.⁷

C. Commission Intervention and T-Mobile’s Refusal to Facilitate Resolution of the Harmful Interference

After the limited testing discussed above, Sirius XM attempted to explore mitigation solutions directly with T-Mobile. T-Mobile initially expressed a willingness to cooperate. It soon became apparent that T-Mobile would offer only limited assistance and would not agree to test the solutions likely to address the harmful interference. Sirius XM then sought assistance and advice from Commission staff. In early February 2015, Sirius XM met with Commission staff to describe the worsening interference issue, discuss the testing it had conducted that identified T-Mobile as the primary source of the interference, seek direction as to how to address the issue and, if necessary, request that the Commission intervene to facilitate a solution.⁸

Commission staff arranged a joint meeting with Sirius XM and T-Mobile, which was held on June 18, 2015. At that meeting, Sirius XM described the harmful interference and noted that it appeared to be primarily caused by the higher-than normal, on-ground power levels of T-Mobile’s AWS signals (as compared to those of other carriers—including Verizon). Sirius XM

⁶ *Id.* ¶¶ 19-21. T-Mobile’s Response is materially misleading and incomplete because it fails to describe this dynamic, and instead focuses on what happened when T-Mobile’s PCS signal was turned off. *See* Response at 13; *see also id.*, Declaration of Steve Sharkey, at ¶ 7 (“Sharkey Declaration”).

⁷ Smith Declaration ¶ 21. Sirius XM also conducted testing with Verizon, which also operates AWS facilities in the New York area, concluding that Verizon’s AWS operations were not causing interference to Sirius XM’s receivers. Verizon’s AWS operations were measured as occurring at substantially lower on-ground levels than T-Mobile’s AWS transmissions. *Id.* ¶ 23.

⁸ *Id.* ¶ 22.

explained that the interference problem was most severe in the New York metropolitan area but that it was likely to quickly grow worse as T-Mobile built out its AWS network. Sirius XM explained that it could not quantify the scope of the problem or manage it going forward without additional testing and knowing more specific information about when, where, and how T-Mobile intended to deploy facilities using AWS spectrum (which information was and is not available publicly).⁹

At the June 18, 2015 meeting, T-Mobile refused to take responsibility for creating the harmful interference to Sirius XM's service and explained that T-Mobile would take no material further steps to mitigate that interference. Among other things, T-Mobile: (i) flatly refused to conduct tests that would identify the precise T-Mobile signal level that causes harmful interference to the Sirius XM service; and (ii) flatly refused to consider any testing that could lead to network changes that T-Mobile did not deem "acceptable."¹⁰

For its part, Sirius XM acknowledged that it might be possible to mitigate some of the harmful interference caused by T-Mobile over time through changes that were already being developed for the Sirius XM receiver design in Response to recent changes in Wireless Communications Service ("WCS") service rules. However, since those changes would be implemented over time, in new vehicles with new satellite receivers built into them (a distribution channel accounting for the vast majority of Sirius XM's subscribers), those changes would not mitigate harmful interference to the Sirius XM service experienced in any of the estimated 70 million vehicles on the road today with built-in Sirius XM receivers. Moreover, those changes might not be implemented for an extended period of time for reasons outside of

⁹ *Id.* ¶ 23.

¹⁰ *Id.* ¶ 24.

Sirius XM's control—*i.e.*, the long lead times needed by automobile manufacturers to incorporate new equipment into their vehicles.¹¹

At the close of the meeting, Commission staff directed both T-Mobile and Sirius XM to examine what they could do to solve the problem, to engage in further discussions, and to return for a follow-up meeting with the Commission in about six weeks.¹² The next day, Sirius XM engineers contacted T-Mobile engineers to propose a series of follow-up tests that could help bound and resolve the harmful interference, and reiterated those requests in subsequent e-mail communications. T-Mobile again refused to facilitate almost all of the tests Sirius XM had proposed.¹³ Instead, T-Mobile maintained its view that it was operating in accordance with Commission requirements and therefore had no obligation to mitigate any harmful interference it was causing Sirius XM. T-Mobile also suggested that any solution potentially impacting T-Mobile's service in any way would be unacceptable and would not be worth exploring.¹⁴

On July 17, 2015, Sirius XM requested that Commission staff move ahead with the six-week follow-up meeting that the Commission suggested on June 18, 2015. Then, Sirius XM met with Commission staff on July 28, 2015 to express its concerns about the absence of any progress with T-Mobile on the course of work recommended at the June 18, 2015 meeting, and

¹¹ *Id.* ¶¶ 25-26.

¹² *Id.* ¶ 27.

¹³ *Id.* ¶ 28. The only test that T-Mobile agreed to perform was one designed to ascertain whether the eventual phase-out of its 3G UMTS signal would improve the interference environment. That test was conducted and the result was that this phase-out would not remediate the interference to Sirius XM.

¹⁴ *Id.* ¶¶ 28-29.

to seek the Commission's assistance in encouraging T-Mobile's cooperation. Only after these efforts proved unsuccessful did Sirius XM file its Objection on August 11, 2015.¹⁵

D. T-Mobile Conduct in Reaction to the Objection

Subsequent to Sirius XM's filing of the Objection, T-Mobile filed its Response and Verizon filed its letter.¹⁶ T-Mobile initially refused to serve Sirius XM with a complete, unredacted copy of its pleading at the time of filing and produced it only after Sirius XM repeatedly pressed its rights, questioning the logic and propriety of not serving Sirius XM with a complete copy that would allow Sirius XM to respond fully.¹⁷

II. T-MOBILE'S PROCEDURAL ARGUMENTS ARE WITHOUT MERIT

A. The Objection Satisfies the Requirements Applicable to Informal Requests for Commission Action and Must Be Considered

Sirius XM filed its Objection as an informal request for Commission action under Section 1.41 of the Commission's rules.¹⁸ The Objection satisfies all requirements applicable to those requests, and, contrary to T-Mobile's suggestions, Sirius XM had good and valid reasons for *not* filing a formal petition to deny the Application.

¹⁵ *Id.* ¶¶ 34-36.

¹⁶ *See generally* Response; Letter from John T. Scott, III, Verizon, to FCC (Aug. 26, 2015) ("Verizon Letter") (submitted in connection with ULS File Numbers identified in the caption hereto).

¹⁷ T-Mobile's approach in claiming that certain information in its Response is "confidential" has been inconsistent at best. As discussed in Section V, *infra*, T-Mobile admits twice that the non-disclosure agreement ("NDA") it has with Sirius XM was intended to protect the proprietary nature of Sirius XM's receiver specifications. Moreover, although T-Mobile has redacted certain assertions about the joint tests (unrelated to the Sirius XM receiver specifications), T-Mobile itself has: (i) publicly disclosed the existence of joint testing by T-Mobile and Sirius XM; (ii) publicly disclosed certain types of joint testing that were conducted; and (iii) publicly described T-Mobile's (selective) views of the results of the joint testing. As T-Mobile publicly revealed these matters in the *unredacted* portion of its Response, the justification for T-Mobile's redactions related to the testing is unclear.

¹⁸ 47 C.F.R. § 1.41; Objection at 2 n.2.

In the June 18, 2015 meeting at which the parties discussed the ongoing harmful interference suffered by Sirius XM and caused by T-Mobile, Commission staff had requested that the parties work with each other in good faith for six weeks to resolve their differences and then attend a follow-up meeting with the Commission by early August.¹⁹ In mid-July, Sirius XM requested that the Commission move ahead with that follow-up meeting. In late July, Sirius XM met separately with Commission staff to again express the need to facilitate a resolution to ongoing harmful interference.²⁰ Sirius XM did not file a petition to deny the Application (prior to the August 5, 2015 deadline established by the Commission's July 22 Public Notice accepting the Application for filing) because: (i) Sirius XM expected that the follow-up meeting would be scheduled imminently²¹ and that filing a petition to deny could undermine the parties' ability to make constructive headway at that meeting;²² and (ii) consistent with basic interference resolution principles, Commission staff had expressly requested that the parties attempt to resolve their issues and that Sirius XM file adversarial pleadings only as a last resort. Once it became apparent that the expected meeting would not occur,²³ Sirius XM had no choice but to move quickly to voice its opposition to the Proposed Transaction by filing the Objection.²⁴ Dismissing the Objection as T-Mobile requests would be akin to punishing Sirius XM for doing

¹⁹ Smith Declaration ¶ 27. This is the anticipated meeting referenced in the Objection at 2 n.2.

²⁰ Smith Declaration ¶¶ 34-35.

²¹ *Id.*

²² A recent communication from T-Mobile has validated this concern. *See infra* at 31 & n.98.

²³ Smith Declaration ¶¶ 33-36.

²⁴ *See generally* Objection at 2 n.2.

all it could to avoid the need for that filing, thereby creating a perverse incentive for parties to file a formal petition to deny while still attempting to negotiate a resolution.²⁵

Notwithstanding this history, a significant portion of T-Mobile's Response argues that the Objection is procedurally defective for failing to meet the formal requirements for a petition to deny.²⁶ As an initial matter, that claim is inapposite because the Objection does not purport to be a petition to deny, affirmatively notes that it is not being filed as a petition to deny, and expressly is styled as an informal objection under Section 1.41 of the Commission's rules.²⁷ Moreover, under longstanding Commission precedent: (i) informal objections expressly lie under Section 1.41 of the Commission's rules;²⁸ (ii) the Commission's public interest mandate is the paramount consideration when addressing informal objections;²⁹ and (iii) the Commission routinely considers informal objections of this type.³⁰ The cases to which T-Mobile cites involving untimely petitions for *reconsideration* are inapposite because there are statutory bars to

²⁵ T-Mobile's suggestion that the June 18, 2015 meeting was some sort of pretext for objecting to the Proposed Transaction, Response at 3-4 & n.7, is demonstrably false, given that the Application was not filed at the Commission until mid-July. What is more plausible is that T-Mobile declined to participate in the six-week follow-up meeting because of concerns about the impact that meeting could have on the timing of the Commission's review of the Proposed Transaction and T-Mobile's planned implementation of its AWS network in additional markets. See Smith Declaration ¶ 37.

²⁶ See Response 2-11.

²⁷ See Objection at 2 n.2.

²⁸ 47 C.F.R. § 1.41.

²⁹ See *WSTE-TV, Inc. v. FCC*, 566 F.2d 333, 337 (D.C. Cir. 1977) ("The overriding concern of the Commission in the granting or denial of applications must be the public interest.").

³⁰ See, e.g., *Wireless Telecommunications, Inc.*, 24 FCC Rcd 3162, at ¶ 11 (2009); *David L. Miller and Infrastructure Networks*, 26 FCC Rcd 16029, at ¶¶ 5-6 (2011); *Green Eagle Networks, Inc. and Covey Communications, Inc.*, 27 FCC Rcd 5732 (2012).

considering late-filed petitions for reconsideration after the Commission has acted.³¹ Perhaps this is why, despite pages of procedural protestations, T-Mobile ultimately concedes that “[t]he Commission has discretion to consider an informal objection” even in this context.³²

Specifically, the Commission “applies a two-step analysis to informal objections under its public interest standard. First, the Commission must determine whether the pleading contains specific allegations of fact sufficient to show that granting the application would be *prima facie* inconsistent with the public interest.”³³ Next, the Commission must determine whether “on the basis of the application, the pleadings filed, or other matters which [the Commission] may officially notice” a substantial and material question of fact has been raised as to whether the Application would serve the public interest.³⁴

Sirius XM has more than met this standard. The Objection establishes that granting the Application would risk any number of public interest harms—*e.g.*, additional harmful interference to Sirius XM and its subscribers, endangering the public interest in preserving an existing broadcast service, and placing additional spectrum rights into the hands of a party lacking the requisite character qualifications to hold them.³⁵ The Commission’s public interest mandate dictates that it consider carefully the issues raised by Sirius XM. The D.C. Circuit has

³¹ See Response at 3 n.4; *see also* 47 U.S.C. § 405(a) (providing that petitions for reconsideration “must be filed within 30 days”).

³² Response at 4 n.8.

³³ *See, e.g., KUQI(DT)*, CDBS File No. BALCDT-20120315ADD (Aug. 28, 2012); *see also Astroline Communications Co., Ltd. Partnership v. FCC*, 857 F.2d 1556 (D.C. Cir. 1988).

³⁴ *Id.* T-Mobile thus misstates the law when it claims that the Commission considers informal objections only “when required by the public interest to address new and vital issues.” Response at 4 n.8. There is no support for such a “new and vital issues” standard.

³⁵ Objection at 5-8.

held that “[t]he overriding concern of the Commission in the granting or denial of applications must be the public interest.”³⁶ In contrast, T-Mobile fails to provide *any* reasoned basis for its suggestion that considering the Objection would be contrary to the public interest, offering only unsupported and conclusory statements to that effect.³⁷

B. The Record Clearly Establishes that Sirius XM is a “Person in Interest”

T-Mobile also incorrectly suggests that the Objection should be ignored because Sirius XM allegedly lacks “standing.” As an initial matter, the Commission has unequivocally articulated that “standing is not a prerequisite to filing an informal objection[.]”³⁸ Rather, as detailed above, the Commission’s public interest mandate is what requires consideration of informal objections.

In any event, the Objection *does* establish that Sirius XM and its subscribers have suffered injury as the result of T-Mobile’s violations of Commission rules and would suffer additional injury if the Application is granted. Namely, doing so would facilitate T-Mobile’s expansion of its AWS operations and its harmful interference into the Sirius XM service. Furthermore, the Objection *does* establish that the potential for such injury is specific to T-Mobile, because the intermodulation interference occurs principally due to the manner in which *T-Mobile* has chosen to deploy its network (*e.g.*, operating well in excess of industry-standard

³⁶ *WSTE-TV, Inc.*, 566 F.2d at 337.

³⁷ T-Mobile also vaguely suggests that the Commission could ignore the Objection “[i]n the interest of fairness, finality and administrative efficiency,” Response at 2, but notably fails to demonstrate that consideration of the Objection would be *unfair* or *inefficient* or undermine administrative finality given that no action on the Application has been taken to date. In any event, the public interest trumps all other considerations.

³⁸ *See Gateway Telecom LLC*, 27 FCC Rcd 6302, at ¶ 9 (2012); *see also, e.g., Nextel License Holdings 4, Inc.*, 17 FCC Rcd 7028, at ¶ 16 (2002) (“[T]here is no standing requirement to file an informal objection pursuant to section 1.41 of the Commission’s rules.”).

power levels). Notably, the injury in question— involving both electromagnetic interference and economic injury to Sirius XM’s service—is the type of “core” injury that both the Commission and the courts have recognized as conferring standing not just for purposes of the Commission’s administrative processes but also under Article III of the U.S. Constitution.³⁹ T-Mobile’s contrary position is groundless.

III. THE APPLICANTS HAVE NOT MET THEIR BURDEN UNDER SECTION 310(D) OF THE COMMUNICATIONS ACT

A. The Applicants Do Not Even Attempt to Establish that the Claimed Benefits of the Proposed Transaction Outweigh the Public Interest Harms Identified by Sirius XM

Section 310(d) of the Communications Act, as amended, provides that no license may be assigned unless the Commission affirmatively finds that the public interest, convenience, and necessity will be served thereby.⁴⁰ Applicants bear the burden of proving, by preponderance of the evidence and after balancing identified public interest harms against claimed public interest benefits, that the transaction serves the public interest.⁴¹ Among other things, the applicants must establish that the proposed assignee (in the case of a “swap,” both applicants) meets the same requirements that it would need to satisfy if it were applying for new licenses, including requisite “citizenship, character, and financial, technical, and other qualifications.”⁴² If the Commission is unable to determine that the proposed transaction serves the public interest for

³⁹ See, e.g., *FCC v. Sanders Bros. Radio Station*, 309 U.S. 470 (1940) (interference and economic injury give rise to standing).

⁴⁰ 47 U.S.C. § 310(d).

⁴¹ See, e.g., *AT&T Inc., Leap Wireless Int’l, Inc., Cricket License Co., LLC and Leap LicenseCo, Inc.*, 29 FCC Rcd 2735, at ¶ 13 (2014); *Sprint Nextel Corp. and SoftBank Corp. and Starburst II, Inc.*, 28 FCC Rcd 9642, at ¶ 23 (2013); *Deutsche Telekom AG, T-Mobile USA, Inc., and MetroPCS Comms, Inc.*, 28 FCC Rcd 2322, at ¶ 14 (2013).

⁴² 47 U.S.C. §§ 308, 310(d).

any reason, or if the record presents a substantial and material question of fact, Section 309(e) of the Act requires that the application be designated for a hearing.⁴³

The Objection demonstrates that the Proposed Transaction would *not* serve the public interest, but rather would give rise to harms that far outweigh the purported benefits claimed by the Applicants. Specifically, the Objection establishes that:⁴⁴ (i) T-Mobile has used its existing AWS licenses in a manner that causes harmful interference to other authorized spectrum users, calling into question whether T-Mobile would use the additional spectrum rights it would acquire through the Proposed Transaction in the same, harmful manner; and (ii) T-Mobile’s pattern of ignoring its obligations to mitigate that harmful interference raises questions as to T-Mobile’s character qualifications.⁴⁵ Accordingly, the Objection urged the Commission to deny the Application or designate it for hearing.

Although T-Mobile suggests that it is “not responsible” for the harmful interference suffered by Sirius XM, the Response does not even attempt to refute Sirius XM’s claims that T-Mobile’s operations are causing that interference, or that such interference constitutes legally cognizable harmful interference under the Commission’s rules and policies. Similarly, the Response does not contest Sirius XM’s showing that T-Mobile has failed to comply with the requirements of Section 27.64 of the Commission’s rules. As the Objection observes, that rule section: (i) explicitly directs AWS licensees to resolve incidents of harmful interference through technical means or by negotiating appropriate operating arrangements—even where those

⁴³ 47 U.S.C. § 309(e).

⁴⁴ Objection at 2-8.

⁴⁵ See *Cellco Partnership d/b/a Verizon Wireless and Atlantis Holdings LLC*, 23 FCC Rcd 17444, at ¶ 32 (2008) (finding that violations of the Act, or of the Commission’s rules or policies, are predictive of an applicant’s future truthfulness and reliability and thus have a bearing on an applicant’s character qualifications) (“*Verizon/Atlantis*”).

operations supposedly are “rule-compliant” (as T-Mobile claims its operations otherwise are); and (ii) establishes that AWS licensees have a general duty to mitigate harmful interference—again, even where caused by operations that appear to comply with specific technical limits set forth in the Commission’s service rules.⁴⁶ T-Mobile’s Response neither acknowledges these obligations nor claims that T-Mobile has satisfied them (which T-Mobile has not done). In fact, T-Mobile’s continued refusal to fully evaluate solutions to the interference it is causing⁴⁷ reflects its reticence to take actions to serve the public interest that, in T-Mobile’s view, do not also serve T-Mobile’s private interests.⁴⁸ It would be appropriate for the Commission to deny the Application without the need for further review.

B. The Proposed Transaction Would Increase the Potential for Harmful Interference into Sirius XM’s Service

The Objection makes specific allegations with respect to the potential for harmful interference posed by T-Mobile’s AWS operations and explains that granting the Application would facilitate harmful interference to the Sirius XM service in additional markets.⁴⁹ Neither T-Mobile nor Verizon addresses these concerns squarely in its responsive filing. Instead, each asserts that those concerns are not “transaction-specific” and claims they should not be considered in the context of this proceeding.⁵⁰

⁴⁶ 47 C.F.R. § 27.64.

⁴⁷ Smith Declaration ¶¶ 33, 36.

⁴⁸ *See Verizon/Atlantis* ¶ 32; *see also EchoStar Communications Corporation*, 17 FCC Rcd 20559, at ¶ 35 (taking EchoStar’s history of misconduct into account “in assessing the likelihood that potential beneficial conduct will occur in the absence of private economic incentives”).

⁴⁹ Objection at 6.

⁵⁰ Response at 10-11; Verizon Letter at 1-2.

As an initial matter, the Application proposes to assign licenses to T-Mobile covering frequencies with the potential to cause, in additional markets, the harmful intermodulation interference already suffered by Sirius XM in certain urban markets. The following table lists the call signs that Verizon proposes to assign to T-Mobile through the Application, along with the frequencies covered by each such call sign:

<u>ULS File No.</u>	<u>Call Sign(s)</u>	<u>Block</u>	<u>Frequencies</u>
0006868798	KNLG206	PCS F	1890-1895/1970-1975 MHz
0006868798	KNLG754	PCS F	1890-1895/1970-1975 MHz
0006868798	KNLG829	PCS E	1885-1890/1965-1970 MHz
0006868798	WQEM929	PCS C	1895-1910/1975-1990 MHz
0006869768	KNLH441	PCS E	1885-1890/1965-1970 MHz
0006869777	KNLG359	PCS F	1890-1895/1970-1975 MHz
0006869790	WQOQ729	PCS B	1870-1885/1950-1965 MHz
0006869871	WPQN807	PCS B	1870-1885/1950-1965 MHz
0006869873	KNLF246	PCS B	1870-1885/1950-1965 MHz
0006869754	WQGA715	AWS F	1745-1755/2145-2155 MHz
0006869754	WQGA717	AWS F	1745-1755/2145-2155 MHz
0006869754	WQGA718	AWS F	1745-1755/2145-2155 MHz
0006869754	WQGB383	AWS B	1720-1730/2120-2130 MHz
0006869754	WQGB384	AWS B	1720-1730/2120-2130 MHz
0006869754	WQGB385	AWS B	1720-1730/2120-2130 MHz
0006869754	WQPW449	AWS D	1735-1740/2135-2140 MHz
0006869754	WQPZ950	AWS E	1740-1745/2140-2145 MHz

Notably, the relevant licenses cover AWS and PCS spectrum rights with the potential to create intermodulation products that cause harmful interference to the Sirius XM service. The following table identifies (in red) combinations of AWS and PCS frequencies having the potential to cause such interference to Sirius XM. Notably, the AWS frequencies include those covered by AWS licenses that would be assigned to T-Mobile if the Application were granted.

Band	Freq.	AWS-1										AWS-2 / -3									
		2110	2115	2120	2125	2130	2135	2140	2145	2150	2155	1995	2000	2020	2155	2160	2165	2170	2175	2180	
PCS	1915	2305	2315	2325	2335	2345	2355	2365	2375	2385	2395	2075	2085	2125	2395	2405	2415	2425	2435	2445	
	1920	2300	2310	2320	2330	2340	2350	2360	2370	2380	2390	2070	2080	2120	2390	2400	2410	2420	2430	2440	
	1925	2295	2305	2315	2325	2335	2345	2355	2365	2375	2385	2065	2075	2115	2385	2395	2405	2415	2425	2435	
	1930	2290	2300	2310	2320	2330	2340	2350	2360	2370	2380	2060	2070	2110	2380	2390	2400	2410	2420	2430	
	1935	2285	2295	2305	2315	2325	2335	2345	2355	2365	2375	2055	2065	2105	2375	2385	2395	2405	2415	2425	
	1940	2280	2290	2300	2310	2320	2330	2340	2350	2360	2370	2050	2060	2100	2370	2380	2390	2400	2410	2420	
	1945	2275	2285	2295	2305	2315	2325	2335	2345	2355	2365	2045	2055	2095	2365	2375	2385	2395	2405	2415	
	1950	2270	2280	2290	2300	2310	2320	2330	2340	2350	2360	2040	2050	2090	2360	2370	2380	2390	2400	2410	
	1955	2265	2275	2285	2295	2305	2315	2325	2335	2345	2355	2035	2045	2085	2355	2365	2375	2385	2395	2405	
	1960	2260	2270	2280	2290	2300	2310	2320	2330	2340	2350	2030	2040	2080	2350	2360	2370	2380	2390	2400	
	1965	2255	2265	2275	2285	2295	2305	2315	2325	2335	2345	2025	2035	2075	2345	2355	2365	2375	2385	2395	
	1970	2250	2260	2270	2280	2290	2300	2310	2320	2330	2340	2020	2030	2070	2340	2350	2360	2370	2380	2390	
	1975	2245	2255	2265	2275	2285	2295	2305	2315	2325	2335	2015	2025	2065	2335	2345	2355	2365	2375	2385	
	1980	2240	2250	2260	2270	2280	2290	2300	2310	2320	2330	2010	2020	2060	2330	2340	2350	2360	2370	2380	
	1985	2235	2245	2255	2265	2275	2285	2295	2305	2315	2325	2005	2015	2055	2325	2335	2345	2355	2365	2375	
	1990	2230	2240	2250	2260	2270	2280	2290	2300	2310	2320	2000	2010	2050	2320	2330	2340	2350	2360	2370	

The ties between the harmful interference that Sirius XM is experiencing and the Proposed Transaction are evident.

Furthermore, and contrary to the Applicants' assertions,⁵¹ the harmful interference at issue is directly tied to *T-Mobile's* specific wireless network configuration and technical choices; it is *not* intrinsic to CMRS operations generally. More specifically, as explained in the Smith Declaration and the Marcus Declaration, that interference is caused primarily by the extremely high on-ground power-density levels emitted by T-Mobile's wireless base stations—which are significantly higher than those specified in the 3GPP LTE standard or those at which other wireless carriers (including Verizon) operate.⁵²

Dr. Marcus provides another way to look at the causation: “From the available data, T-Mobile base station power levels are providing the heat that ignites the fire and causes the intermodulation.”⁵³ Consequently, T-Mobile's status as the proposed licensee of the call signs in question is a very relevant factor. Furthermore, it is reasonable to expect that interference to spread as T-Mobile continues to deploy its AWS wireless network in the same manner in other

⁵¹ Response at 14-15; Verizon Letter at 1.

⁵² Smith Declaration ¶¶ 16-17; Marcus Declaration ¶¶ 12-17, 22-23.

⁵³ Marcus Declaration ¶ 17.

markets. It bears emphasis that the Applicants themselves have maintained that granting the Application would facilitate T-Mobile's AWS deployment⁵⁴ which, as discussed above, would exacerbate the potential for causing additional, harmful interference to Sirius XM.

C. T-Mobile Is Causing the Harmful Interference Suffered by Sirius XM

T-Mobile attempts to avoid responsibility for the harmful interference caused by its high-powered AWS operations by asserting that it is a "receiver problem"—and somehow not T-Mobile's fault or responsibility to help mitigate.⁵⁵ T-Mobile's attempts to deny its culpability ring hollow. As an initial matter, this position is inconsistent with decades of Commission precedent recognizing that intermodulation interference is a legally cognizable form of "harmful interference" for which the operators of transmitting facilities bear responsibility.⁵⁶

The Commission has held licensees accountable for creating intermodulation interference even where the service rules in question would not otherwise expressly prohibit the transmissions giving rise to the interference. In the final stages of adopting AWS rules, the

⁵⁴ Application Narrative at 5.

⁵⁵ Response at 1, 6, 15-16; Sharkey Declaration ¶ 6.

⁵⁶ See, e.g., *Amendment of Parts 89, 91, 93, and 95*, FCC 67-1075, at ¶ 4 (1967) (noting that "a persistent and troublesome source of harmful interference in the land mobile service occurs as a result of what is known generally as intermodulation (IM) interference."); *Russel Shaffer*, 17 FCC.2d 73, at ¶ 37 (1968) ("Harmful interference to reception is expected principally from the presence of signals of a strength sufficient to cause intermodulation and spurious responses in highly sensitive receivers of good design."); *Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Bands*, 20 FCC Rcd 4616, at ¶ 59 (2005) (requiring licensees to take steps to mitigate intermodulation issues, including by work[ing] together to resolve the interference problem."); *Service Rules for the Advanced Wireless Services H Block*, 28 FCC Rcd 09483, at ¶ 90 (2013) ("The record contains three technical studies that examined the potential for Lower H Block operations to cause harmful interference, including overload, intermodulation and interference from out-of-band emissions, to PCS [receivers]."); see also *Sixth Report and Order*, Dockets 8736,8975,8976,9175, 41 FCC 148 (1952) (imposing minimum spacing requirements to prevent intermodulation interference into television receivers); Marcus Declaration ¶¶ 4, 7-10, 13-18.

Commission addressed the circumstances where the relocation of certain Broadband Radio Service (“BRS”) licensees would be required, including where BRS receivers suffer intermodulation interference from AWS transmissions. In doing so, the Commission was careful to note the limits of any “bright line” test about when intermodulation or other forms of harmful interference would occur or how it might be caused, and clarified: “[I]f any AWS system . . . causes actual and demonstrable interference to a BRS system, then the AWS licensee is responsible for taking the necessary steps to eliminate the harmful interference”⁵⁷ It follows that T-Mobile, as the entity causing harmful interference through its transmissions (in whole or part, and whether from its AWS or other transmissions), is responsible for mitigating that interference.

T-Mobile’s attempt to characterize the harmful interference suffered by Sirius XM as a “receiver problem” also is inconsistent with a plain reading of Section 27.64 of the Commission’s rules. That rule directs AWS licensees to resolve intermodulation interference by technical means.⁵⁸ Section 27.64 expressly distinguishes that mandate from other “[s]ituations in which no protection is afforded,” including where interference is experienced by certain types of receivers.⁵⁹ Moreover, the Commission has contrasted the requirements of existing Section 27.64 with alternative proposed formulations for that rule that ultimately were not adopted, but

⁵⁷ *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 Service Rules for Advanced Wireless Services*, 21 FCC Rcd 4473, at ¶ 54 (2006) (characterizing intermodulation as harmful interference and directing AWS licensees to take “the necessary steps to eliminate the harmful interference”).

⁵⁸ 47 C.F.R. § 27.64(b).

⁵⁹ Compare 47 C.F.R. § 27.64(b) with 47 C.F.R. § 27.64(c).

that would have required “each licensee ultimately to assume responsibility for protecting its own receiving system from interference”⁶⁰

The technical nature of intermodulation interference also does not render it a “receiver problem” that can be ignored by T-Mobile (or the Commission). Perhaps most egregiously, T-Mobile suggests that intermodulation is a “receiver problem” because interference occurs in or through a Sirius XM receiver.⁶¹ This is the case with virtually all forms of interference, and provides no valid basis for shifting responsibility for intermodulation interference to the victim—particularly where the Commission has recognized intermodulation interference as “harmful.” Notably, the Commission has long recognized that intrinsic receiver limitations are an integral part of spectrum policy and must be accounted for in its regulations (*e.g.*, through limitations on transmitter locations and power levels) even though theoretically “perfect” receivers would not suffer from such limitations.⁶² Significantly, T-Mobile itself has acknowledged that “there are practical physical limits to the ability of mobile receive filters to eliminate adjacent-band interferers that are very strong and very close spectrally” and that “[n]o perfect filter exists; therefore no filter can reject all adjacent-band signals.”⁶³ There is no basis for T-Mobile’s view that intermodulation interference is a “receiver issue” simply because of limitations inherent in receiver design.⁶⁴

⁶⁰ See, *e.g.*, *Reallocation and Service Rules for the 698-746 MHz Spectrum Band (Television Channels 52-59)*, Notice of Proposed Rulemaking, 16 FCC Rcd 7278, at ¶ 74 (2001).

⁶¹ See Response at 6 (suggesting that intermodulation is a “receiver issue” because it is caused by “[i]ntermodulation products present within the active antennas of Sirius XM receivers”).

⁶² Marcus Declaration ¶ 6.

⁶³ Comments of T-Mobile USA, Inc., WT Docket No. 07-195, at 12 (July 25, 2008).

⁶⁴ See Marcus Declaration ¶ 6.

Furthermore, as explained in the Marcus Declaration, intermodulation interference occurs from the simultaneous combination of multiple factors—including at least one high-powered signal, such as an extremely high-powered AWS signal transmitted by T-Mobile.⁶⁵ In other words, Sirius XM’s receivers alone are not—and could not be—responsible for the interference in question.⁶⁶ Accordingly, and contrary to T-Mobile’s suggestions, responsibility for solving the problem does not rest solely or primarily on Sirius XM.

T-Mobile ignores that *it* could mitigate the intermodulation interference in question simply by transmitting in a manner similar to other wireless carriers. If T-Mobile simply limited its power levels to approximately the level specified in the 3GPP standard, then that alone would protect Sirius XM operations.⁶⁷ T-Mobile fails to explain why, under its theory, the existence of *that* solution does not render intermodulation a “transmitter problem.” T-Mobile’s position appears to be that Sirius XM alone should bear the burden of mitigating intermodulation interference that Sirius XM is not causing. This is untenable and contrary to logic, not to mention Commission rules and policy.

⁶⁵ *Id.* ¶ 5.

⁶⁶ Equally unavailing is T-Mobile’s suggestion that the intermodulation interference at issue is a “receiver problem” because it might be possible for Sirius XM to implement a costly and complex redesign of its receivers *over time* to mitigate that interference (more robust receiver designs may be available in the marketplace starting in about three years, *see* Marcus Declaration ¶ 20). T-Mobile’s position assumes that because a party *could* implement a mitigation solution, it *must* implement that solution. But the fact that filtering or other “receiver-side” solutions could be implemented *over time* does not render the intermodulation interference suffered by Sirius XM subscribers *now*, or before the time such solutions could be implemented as a practical matter, a “receiver problem”—particularly where Section 27.64 directs AWS licensees to implement technical solutions to mitigate such interference.

⁶⁷ *See* Marcus Declaration ¶ 22; *see also id.* ¶¶ 21-22 (discussing other potential solutions to the intermodulation interference caused by T-Mobile’s operations).

Holding aside T-Mobile's transparent effort to blame the victim, it bears emphasis that Sirius XM historically has designed its receivers to: (i) comply fully with 3GPP specifications;⁶⁸ (ii) account for the manner in which almost all wireless carriers (with the sole exception of T-Mobile) operate;⁶⁹ and (iii) be more than 60 times more resilient to intermodulation interference than the requirement for 4G LTE handsets.⁷⁰ It is unreasonable to expect Sirius XM to design receivers to guard against all potential forms of interference from adjacent operators, as T-Mobile suggests, particularly where: (i) the Commission's rules make *T-Mobile* responsible for mitigating harmful interference; (ii) no Commission rules directly limit the on-ground emissions levels at which T-Mobile may operate, which are a primary cause of the intermodulation interference in question; and (iii) no one could design receivers that accommodate all possible wireless network configurations.⁷¹ It would be far more reasonable to conclude that *T-Mobile*

⁶⁸ See Smith Declaration ¶ 15; Marcus Declaration ¶ 20. The parameters of today's CMRS operations—including T-Mobile's—are informed by standards developed by 3GPP. See *id.* ¶ 12.

⁶⁹ See Smith Declaration ¶¶ 15, 17. Sirius XM's receivers were designed to account for power levels at which wireless base stations transmit 99 percent of the time, consistent with 3GPP standards and other relevant literature. Power levels above this threshold typically provide no added benefit to the consumer but can have a significant and adverse impact on other spectrum users. See Marcus Declaration ¶ 11. T-Mobile's base stations are producing on-street power levels that are approximately one-million times those necessary to provide service there, and significantly exceed the wireless industry standards for CMRS receivers. Although it is possible that T-Mobile is transmitting at high power levels in an attempt to serve locations within buildings, this can be accomplished with alternative antenna designs or positioning that do not also blanket streets with high-powered signals. See Marcus Declaration ¶¶ 15-17, 22-23.

⁷⁰ See Smith Declaration ¶ 15; Marcus Declaration ¶ 20.

⁷¹ As explained above and in the Marcus Declaration, T-Mobile's network operates in a significantly different manner than other wireless carriers and appears to vary substantially from the operating environment defined in 3GPP specifications. See Marcus Declaration ¶¶ 15-17, 22. For these reasons, Sirius XM could not reasonably have anticipated the interfering nature of T-Mobile's operations in designing its satellite radio network.

has failed to study the potential for *its* network to cause harmful interference and design its network in a way that minimizes the potential for that interference.

D. T-Mobile Lacks the Character Qualifications to Acquire Additional Licenses

The Objection explains why T-Mobile’s failure to satisfy its obligations under Section 27.64 of the Commission’s rules casts doubt upon its character qualifications to acquire additional Commission licenses.⁷² The Commission must find that T-Mobile meets the same requirements that it would need to satisfy if it were applying for new licenses, including having requisite “citizenship, character, and financial, technical, and other qualifications.”⁷³ T-Mobile asserts that this claim is “ludicrous on its face,”⁷⁴ even though: (i) T-Mobile does not deny that it has failed to satisfy its obligations under Section 27.64; and (ii) the Response evidences both T-Mobile’s refusal to engage meaningfully with Sirius XM and T-Mobile’s articulation of positions antithetical to the policies underlying Section 27.64.

In the Sharkey Declaration, T-Mobile confirms its refusal to test any scenarios that could require a change in the way T-Mobile operates its network—including testing the impact of a temporary reduction of its AWS and PCS power levels.⁷⁵ T-Mobile has categorically refused to discuss the class of technical solutions most likely to mitigate the intermodulation interference in question. This approach is wholly inconsistent with Section 27.64’s mandate that AWS licensees attempt to resolve intermodulation interference by technical means.

⁷² Objection at 7-8.

⁷³ 47 U.S.C. §§ 308, 310(d).

⁷⁴ Response at 7.

⁷⁵ See Sharkey Declaration ¶ 12.

This alone would be sufficient to disprove any suggestion that T-Mobile has responded in a “prompt and collaborative manner”⁷⁶ to requests from Sirius XM—even if T-Mobile’s characterization of relevant facts otherwise were accurate (which it is not). As the Smith Declaration explains, T-Mobile has repeatedly refused Sirius XM’s requests for technical information, refused to conduct requested tests, and refused to consider developing technical interference mitigation solutions that would require any changes to T-Mobile’s network.⁷⁷

In short, notwithstanding T-Mobile’s attempt to conflate the “character” issue with the potential for the license assignment to exacerbate harmful interference, the issues can and must be examined separately. Even if *no* such potential for increased harmful interference existed, T-Mobile’s rule violations still would render grant of the spectrum swap contrary to the public interest.

IV. SUBSTANTIAL AND MATERIAL QUESTIONS OF FACT REMAIN UNRESOLVED ON THE RECORD

Substantial, material, and unresolved questions of fact exist on the record, which bear directly on the public interest analysis of the Proposed Transaction. At a minimum, these questions of fact require resolution in a hearing under Section 309(e) of the Act. T-Mobile’s Response does nothing to resolve these questions and *introduces* a number of specific factual disputes that are both substantial and material to the Commission’s analysis. These include (among others):

- ***The full extent of T-Mobile’s harmful interference to Sirius XM.*** As noted above, the Objection establishes that Sirius XM is suffering harmful interference, that T-Mobile’s operations are the primary cause, and that this problem will

⁷⁶ Response at 7.

⁷⁷ Smith Declaration ¶¶ 24, 28-33.

worsen if allowed to continue. T-Mobile’s Response does not refute these claims. However, T-Mobile questions the geographic scope of the problem, broadly asserting that the Objection “makes unsupported—and untrue—accusations relating to interference to Sirius XM devices”⁷⁸

- ***The extent to which harmful interference experienced by Sirius XM is impacted by the identity of the entity operating on interfering frequencies and the parameters within which that entity operates.*** T-Mobile asserts that “granting the licenses at issue in this proceeding will not harm Sirius XM” because the intermodulation interference experienced by Sirius XM allegedly is a “receiver issue, not a transmitter issue”⁷⁹ that would exist regardless of the identity of the transmitting licensee(s). Sirius XM disputes this characterization for the reasons set forth above, which explain why the nature of T-Mobile’s network is the primary cause of the interference, and which merit closer scrutiny through a hearing if the Commission is unable to make a summary determination in favor of Sirius XM’s position.
- ***The extent to which grant of the Application, and T-Mobile’s AWS deployment in the markets covered thereby, would exacerbate the harmful interference T-Mobile is causing Sirius XM.*** T-Mobile questions the “causal relationship” between T-Mobile’s AWS deployment and the interference Sirius XM is suffering.⁸⁰ As explained above, in the Smith Declaration, and in the Marcus Declaration, the intermodulation interference suffered by Sirius XM is the result

⁷⁸ Response at 5.

⁷⁹ *Id.* at 1, 6; Sharkey Declaration ¶ 6.

⁸⁰ Response at 14.

of the particular manner in which T-Mobile has chosen to operate its AWS network.⁸¹ Namely, “T-Mobile base station power levels are providing the heat that ignites the fire and causes the intermodulation.”⁸² T-Mobile’s contrary view represents yet another unresolved factual dispute that is substantial and material to the disposition of the Application.

- ***Whether the “efficiency” that T-Mobile asserts as a public interest benefit is instead a public interest harm.*** The Application claims that the Proposed Transaction will give rise to certain “efficiencies.”⁸³ T-Mobile claims that Sirius XM has not disputed “T-Mobile’s position that this transaction will allow the parties to make a more efficient use of spectrum”⁸⁴ To the contrary, the Objection expressly *does* challenge T-Mobile’s claim that the “efficiencies” the Application claims are public interest *benefits* and instead characterizes them as public interest *harms*. As the Objection notes, “facilitating T-Mobile’s continued buildout of AWS frequencies by making that buildout more ‘efficient’ also would facilitate T-Mobile’s ability to create harmful interference to Sirius XM and its subscribers, including in additional markets that may not currently be receiving interference from T-Mobile’s AWS operations.”⁸⁵ Particularly given that this asserted “efficiency” is the *only* public interest benefit asserted by the Applicants, the resolution of this question of fact is substantial and material to the disposition

⁸¹ See Smith Declaration ¶¶ 6-18; Marcus Declaration ¶¶ 15-17.

⁸² See Marcus Declaration ¶ 17.

⁸³ Application Narrative at 4-5.

⁸⁴ Response at 10.

⁸⁵ Objection at 6.

of the Application. Absent such resolution, there is no basis upon which Commission could conclude that the public interest benefits of the Proposed Transaction outweigh the associated public interest harms.

- ***Whether T-Mobile’s operations comply fully with the Commission’s technical rules.*** The Response asserts that T-Mobile “has confirmed that its AWS and PCS systems in the relevant markets comply fully with the Commission’s rules.”⁸⁶ However, T-Mobile provides no evidence to support this assertion, such as whether its high-powered base stations comply with relevant power limits, whether the operation of such base stations on top of a one-story building complies with the Commission’s RF safety limits, and whether T-Mobile’s operations comply with all other applicable Commission rules. As detailed above, T-Mobile does not even attempt to address the demonstration that T-Mobile has ignored its obligations under Section 27.64 of the Commission’s rules. A hearing would be an appropriate forum in which to evaluate the actual extent of T-Mobile’s rule compliance and how any violations relate to T-Mobile’s proposed use of the additional AWS and PCS spectrum rights covered by the Application.
- ***What conclusions can be drawn from the limited testing conducted to date.*** T-Mobile asserts that it cannot be held accountable for the harmful interference caused by its AWS transmissions because that interference did not disappear when T-Mobile discontinued its *PCS* transmission in the same markets.⁸⁷ This statement is materially misleading. As the Smith Declaration explains, what

⁸⁶ Response at 15.

⁸⁷ *Id.* at 13.

actually happened in the testing is that *the interference disappeared when T-Mobile's discontinued its AWS transmissions*.⁸⁸ T-Mobile's AWS operations are the primary cause of the harmful interference experienced by Sirius XM.⁸⁹ In any event, these competing interpretations of testing results reflect an unresolved question of fact that is substantial and material to the disposition of the Application.

- ***The nature and extent of the “cooperation” offered by T-Mobile.*** T-Mobile's reply accuses Sirius XM of “falsely assert[ing] that T-Mobile has refused to investigate concerns Sirius XM has raised or work with Sirius XM on alleged interference issues.”⁹⁰ To the contrary, and as reflected in the Smith Declaration, T-Mobile has repeatedly refused: (i) to provide information to Sirius XM about when, where and how T-Mobile intended to deploy AWS frequencies in other markets; (ii) to conduct tests that would identify the precise T-Mobile signal level that starts to disrupt the Sirius XM service; or (iii) to consider any testing that could lead to technical changes in its network that T-Mobile did not deem acceptable.⁹¹ The resolution of these questions of fact are not only disputed matters that must be resolved through a hearing, but also bear on T-Mobile's character and whether the grant of the Application would serve the public interest.
- ***Whether T-Mobile has the requisite character to serve as a Commission licensee.*** Substantial, material, and unresolved questions of fact exist as to

⁸⁸ See Smith Declaration ¶ 21.

⁸⁹ *Id.* ¶ 18.

⁹⁰ Response at 12.

⁹¹ See Smith Declaration ¶¶ 24, 28-33.

whether T-Mobile has the requisite character qualifications to serve as a licensee—particularly in light of its utter refusal to comply with the requirements of Section 27.64.⁹²

- ***Other Factual Disputes.*** Exhibit 1 hereto identifies a number of other claims that T-Mobile has made in the Response, the accuracy and truthfulness of which are disputed by Sirius XM.

V. T-MOBILE’S REQUEST FOR SANCTIONS IS WITHOUT MERIT

T-Mobile succeeds only in underscoring the weakness of its own position by baselessly claiming that “Sirius XM’s pleading serves no other purpose but to harass, cause unnecessary delay and increase the cost of license assignments,”⁹³ as though it would somehow be appropriate for the Commission to sanction Sirius XM for protecting its interests and advancing a legal position contrary to that of T-Mobile. The simple fact is that Sirius XM had, and has, a good-faith basis for pursuing its objection against the Proposed Transaction, for all of the legally and factually substantiated reasons set forth in this Reply and in the Objection.

Notably, the various cases cited by T-Mobile⁹⁴ involved situations in which the Commission found that parties had raised claims that were patently meritless interpretations of the law. Sirius XM’s position is grounded firmly in Commission precedent establishing that the intermodulation interference Sirius XM is suffering is legally cognizable harmful interference primarily caused by T-Mobile.

Having convened a meeting between the parties, the Commission already has acknowledged the legitimacy of Sirius XM’s concerns and that, at a minimum, those concerns

⁹² See Section III.D, *supra*.

⁹³ Response at 16.

⁹⁴ *Id.* at 17-18.

merit further exploration. Furthermore, the Commission planned to convene a follow-up meeting to discuss these issues. The issues that were the subject of those meetings also are directly related to the Commission’s consideration of the Application. If anyone should be sanctioned, it is T-Mobile:

First, T-Mobile failed to serve Sirius XM with a complete, unredacted copy of the Response, although the certificate of service attached to the Response claims that a “true and correct copy” thereof was served upon Sirius XM and its outside counsel by hand on August 26, 2015. T-Mobile did not provide those copies in a timely fashion—notwithstanding the language in the certificate of service—but did so late the following day (August 27, 2015) only after Sirius XM had pressed its rights repeatedly. T-Mobile has never corrected the record on this point and therefore has compounded its noncompliance by misrepresenting in writing its actions to the Commission.

Second, in seeking sanctions against Sirius XM, *T-Mobile* has advocated a position that is “patently meritless” and “patently inimical to a plain reading of the law.”⁹⁵ Notably, both T-Mobile’s chief technical expert in this matter⁹⁶ and its outside counsel in this matter⁹⁷ previously

⁹⁵ See *Lockheed Martin Corp.*, 18 FCC Rcd 16605 ¶¶ 8-9 (2003); *Nevada Wireless*, Order, 14 FCC Rcd 11874, n.5 (1999) (both cited in Response at 17 n.43).

⁹⁶ See, e.g., Letter from Steve B. Sharkey, Motorola, to FCC, WT Docket No. 02-55, Att. at 5 (Oct. 31, 2002) (urging the Commission to explore retuning and power reductions of CMRS transmitters to avoid intermodulation into adjacent receivers); Letter from Steve B. Sharkey, Motorola, to FCC, WT Docket No. 02-55, Att. at 14 (Sep 20, 2002) (noting that a “A Combination of Steps are Required to Mitigate [Intermodulation] Interference” and recognizing that it is “[i]mpractical to retrofit existing [receivers]”); Letter from Steve B. Sharkey, Motorola, to FCC, WT Docket No. 02-55, Att. 2 (May 21, 2002) (recommending that operators share site-specific data and take other steps to proactively prevent intermodulation interference).

⁹⁷ See, e.g., Letter from Trey Hanbury, Sprint Nextel, to FCC, ET Docket No. 00-258, at 1-2 (urging the Commission to require AWS licensees to relocate BRS systems to avoid the

have argued that receiver manufacturers and customers are *not* solely responsible for mitigating intermodulation interference when it arises. While Sirius XM understands that the positions adopted by advocates may change to reflect the positions of the “client,” advocates who have adopted a position previously cannot in good faith turn around and assert that those petitions are so “patently inimical to a plain reading of the law” that sanctions are in order. That request is irresponsible and reflects a desire on T-Mobile’s part to harass rather than contribute meaningfully to the resolution of any *bona fide* difference of positions.

Third, T-Mobile has compounded its noncompliance with Section 27.64 by suggesting that it will engage fully with Sirius XM only *after* Sirius XM withdraws its Objection. Specifically, in a recent letter filed in this proceeding T-Mobile has suggested that Sirius XM withdraw its Objection “[t]o encourage candid discussion” as the pendency of the Objection “adds a legal complexity that impedes collaborative discussion.”⁹⁸ This comment is inconsistent with the requirements of Section 27.64 and the Commission’s rules. Section 1.935(c) of the Commission’s rules explicitly bars a party from offering valuable consideration—including a commitment to comply with the Commission’s rules—in exchange for the other party withdrawing an informal objection.⁹⁹

Finally, T-Mobile has grossly mischaracterized Sirius XM’s actions with respect to T-Mobile’s non-disclosure agreement (“NDA”) with Sirius XM. Sirius XM acknowledges that the Commission does not typically involve itself in private contractual matters, such as T-Mobile’s

effects of intermodulation and other forms of harmful interference from AWS transmitters into BRS receivers).

⁹⁸ Letter from Steve Sharkey, T-Mobile USA, Inc., to Craig Wadin, Sirius XM Radio, Inc., at 3 (Sep. 2, 2015) (submitted in connection with ULS File Numbers identified in the caption hereto).

⁹⁹ 47 C.F.R. § 1.935(c).

claims about the NDA. Nevertheless, a brief Response is warranted to T-Mobile's attempts to cast aspersions on Sirius XM for having discussed with Commission staff, in T-Mobile's presence, the joint testing conducted that established T-Mobile's AWS operations as the primary source of interference into the Sirius XM service. T-Mobile's suggestion that there was something untoward with Sirius XM's having discussed on June 18, 2015, with the Commission and in T-Mobile's presence, the existence of the joint testing, the scope of the testing, and the results of testing, is belied by T-Mobile's own behavior. T-Mobile expressed no concerns to Sirius XM about the scope of the NDA at that meeting, or in the subsequent two month period; nor did it object to the fact of Sirius XM's presentation to the Commission at that meeting. Second, T-Mobile itself has (i) publicly disclosed the existence of joint testing by T-Mobile and Sirius XM, (ii) publicly disclosed certain types of joint testing that was conducted, and (iii) publicly described T-Mobile's (selective) views of the results of the joint testing.¹⁰⁰ T-Mobile made such public disclosures despite having redacted similar information about such matters in other parts of the Sharkey Declaration and its pleading.¹⁰¹ Moreover, T-Mobile admits twice that the NDA was intended to protect the proprietary nature of Sirius XM's receiver specifications,¹⁰² and recognizes that T-Mobile has no interest of its own in the information covered by the NDA. For these reasons, Sirius XM has redacted only a single reference in this pleading and the associated declarations, and is seeking confidential treatment of such information.

¹⁰⁰ Sharkey Declaration ¶¶ 5-7.

¹⁰¹ *See id.*

¹⁰² Response at 12 n.29; Sharkey Declaration ¶ 5 (affirming that the NDA was negotiated "to facilitate the sharing of confidential technical information between T-Mobile and Sirius XM, specifically the design specifications of the Sirius XM receivers.").

VI. CONCLUSION

The record establishes that T-Mobile has used its AWS and PCS licenses to cause harmful interference into other authorized spectrum users and that granting the Application would facilitate additional such interference. The record also establishes that T-Mobile has ignored its obligations as a Commission licensee to mitigate that harmful interference. These factors demonstrate that granting the Application would not serve the public interest, convenience and necessity. At a minimum, substantial and material questions of fact exist that are relevant to an assessment of the asserted benefits, and that also bear on the likely harms, of the Proposed Transaction. For these reasons, Sirius XM reiterates that the Application should be denied or designated for a hearing.

Respectfully submitted,

/s/ John P. Janka
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September 11, 2015

EXHIBIT 1: DISPUTED FACTS

EXHIBIT 1: DISPUTED FACTS

<u>Claim:</u> “The design of Sirius XM’s receivers means that <i>any</i> carrier or combination of carriers operating on the proper combination of AWS and PCS frequencies in the same geographic area could produce the intermodulation products that concern Sirius XM.” Response at 1-2.	<u>Fact:</u> Only extremely high-powered carriers operating in the proper combination of AWS and PCS frequencies are capable of causing intermodulation interference into the Sirius XM service. For example, Verizon’s operations in the New York metropolitan area do not create the same problem that T-Mobile’s operations cause.
<u>Claim:</u> “Sirius XM knew or should have known of the potential for intermodulation products for at least a decade.” Response at 2.	<u>Fact:</u> Sirius XM designed the overall performance of the Sirius XM service with reference to the expected EIRP levels from AWS-1 and PCS base stations specified in 3GPP standards. Sirius XM receivers are 18 dB, or more than 60 times, more resilient to intermodulation interference than the requirement for 4G LTE handsets.
<u>Claim:</u> “T-Mobile has fully complied with all applicable Commission rules.” Response at 2.	<u>Fact:</u> T-Mobile has not attempted to resolve intermodulation interference by technical means, as required by Section 27.64 of the Commission’s rules.
<u>Claim:</u> “Sirius XM’s employees organized a meeting with FCC staff for June 18, 2015.” Response at 5.	<u>Fact:</u> According to the email from FCC staff inviting Sirius XM and T-Mobile to this meeting, FCC staff arranged the June 18, 2015 meeting in order “to discuss the interference Sirius XM has been experiencing due to intermodulation from PCS and AWS-1 base stations. The purpose of the meeting is for FCC staff to better understand the nature of the interference and possible ways to mitigate it.”
<u>Claim:</u> “Until Sirius XM can remedy its receiver deficiency, Sirius XM’s personnel indicated that certain combinations of authorized PCS and AWS services operating in a manner consistent with the applicable operational limitations could cause Sirius XM receivers to experience	<u>Fact:</u> Sirius XM expressed the view that the service disruptions were caused by higher-than-normal wireless base station operations. Sirius XM did not describe the problem as a receiver deficiency, and disagrees with that characterization of the interference. As noted above, Sirius XM designed

service disruptions.” Response at 6.	the overall performance of the Sirius XM service with reference to the expected EIRP levels from AWS-1 and PCS base stations specified in 3GPP standards. Sirius XM receivers are 18 dB, or more than 60 times, more resilient to intermodulation interference than the requirement for 4G LTE handsets.
<u>Claim:</u> “T-Mobile repeatedly and consistently responded in a prompt and collaborative manner to inquiries from Sirius XM and remains willing to work with Sirius XM to identify the service disruption its receivers allegedly experience in the presence of lawfully operating broadband services using PCS and AWS spectrum. T-Mobile’s responsive efforts have exceeded any necessary effort to address Sirius XM’s concerns.” Response at 7.	<u>Fact:</u> As detailed in the Smith Declaration, T-Mobile has declined on numerous occasions to provide information or engage in testing requested by Sirius XM.
<u>Claim:</u> “Sirius XM personnel conceded during the June 18, 2015 meeting with Commission staff that Sirius XM could have addressed the muting issue if Sirius XM had designed its receivers with better intermodulation rejection and more adequate filtering than the company ultimately chose to adopt.” Response at 8.	<u>Fact:</u> Sirius XM made no such concession.
<u>Claim:</u> “Sirius XM also is unable to point to any interference caused directly by T-Mobile’s operations.” Response at 9.	<u>Fact:</u> As detailed in the Smith Declaration, during the joint testing conducted with T-Mobile, when T-Mobile’s AWS carriers were turned off, the intermodulation interference into Sirius XM stopped.
<u>Claim:</u> “T-Mobile’s equipment is type certified to 3GPP specifications and measurements taken by T-Mobile demonstrate that the power-density levels T-Mobile has deployed are not unique to T-Mobile’s system.” Response at 9.	<u>Fact:</u> As detailed in the Smith Declaration, T-Mobile is operating its base stations in Manhattan at levels that are approximately 16 to 20 dB, or about 40 to 100 times, higher than those in the 3GPP specification; the measured power levels emitted on frequencies

	licensed to T-Mobile were materially higher than those measured on frequencies licensed to other wireless carriers.
<u>Claim:</u> “Sirius XM falsely asserts that T-Mobile has refused to investigate concerns Sirius XM has raised or work with Sirius XM on alleged interference issues.” Response at 12.	<u>Fact:</u> As detailed in the Smith Declaration, T-Mobile has declined on numerous occasions to provide information or engage in testing requested by Sirius XM.
<u>Claim:</u> “Sirius XM falsely claims that ‘T-Mobile has refused to conduct appropriate tests’ to assess the alleged interference.” Response at 13.	<u>Fact:</u> T-Mobile flatly refused to conduct tests that would identify the precise T-Mobile signal level that starts to disrupt the Sirius XM service. T-Mobile also flatly refused to consider any testing that could lead to technical changes in its network that T-Mobile did not deem acceptable
<u>Claim:</u> “As Sirius XM conceded during the meeting with Commission staff, the muting in Sirius XM’s receivers continued <i>even after T-Mobile turned its PCS network completely off.</i> ” Response at 13.	<u>Fact:</u> At the meeting, Sirius XM explained that whenever the T-Mobile AWS signal was turned off, the disruption to the Sirius XM service disappeared, and that this occurred even when the T-Mobile PCS signal was still operating.
<u>Claim:</u> “Sirius XM also falsely claims that ‘T-Mobile has refused to . . . provide technical information to Sirius XM.’” Response at 13.	<u>Fact:</u> As detailed in the Smith Declaration, T-Mobile has declined on numerous occasions to provide technical information requested by Sirius XM
<u>Claim:</u> “Sirius XM explained to the Commission in its June 18, 2015, meeting with staff that the company was aware that it could resolve the interference issues on its own.” Response at 15.	<u>Fact:</u> Sirius XM said no such thing. Sirius XM explained that (i) it is not possible to identify the Sirius XM customers who likely would experience interference from T-Mobile, and (ii) it may not be practical to try to retrofit existing vehicles with new Sirius XM receivers because of the way that those receivers are integrated into the design of the vehicles.
<u>Claim:</u> “Sirius XM even conceded that it has a long-term plan to improve the filtering on its receivers, which would prevent the interference it allegedly is experiencing in certain geographically focused areas.” Response at 15.	<u>Fact:</u> Sirius XM explained that it would not be possible to make Sirius XM receivers fully resilient to interference sources such as T-Mobile’s without there being also some limits on the level of on-ground emissions that could be produced by such

	interference sources.
<p><u>Claim:</u> “[I]t should have surmised that [AWS and PCS] deployments could potentially create signal levels in which intermodulation products could cause muting if receivers are not capable of rejecting those products. Sirius XM had all the information needed to be proactive and avoid muting by designing receivers with better intermodulation rejection and adequate filtering of intensively used spectrum bands.” Response at 16.</p>	<p><u>Fact:</u> Sirius XM designed the overall performance of the Sirius XM service with reference to the expected EIRP levels from AWS-1 and PCS base stations specified in 3GPP standards. Sirius XM receivers are 18 dB, or more than 60 times, more resilient to intermodulation interference than the requirement for 4G LTE handsets.</p>
<p><u>Claim:</u> “Commission staff during the June 18 meeting raised the potential for Sirius XM to mitigate much of the muting its receivers may be experiencing by adding additional repeaters in areas experiencing this issue. Sirius XM said it has elected to ignore this possibility because it believes such a solution would be too complex and costly.” Response at 16.</p>	<p><u>Fact:</u> Sirius XM indicated that it may not be possible to mitigate the interference with additional repeaters without causing self-interference to its wanted signal that may offset any improvement.</p>
<p><u>Other claims from the Sharkey Declaration:</u> The Smith Declaration provides a rebuttal of various misstatements and half-truths provided in the Sharkey Declaration, which are too numerous list here.</p>	

EXHIBIT 2: DECLARATION OF TERRENCE SMITH

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

In the Matter of	) ULS File Nos. 0006867447, 0006868438,
	) 0006868544, 0006867476, 0006867520,
Assignment Applications of	) 0006867467, 0006867470, 0006867545,
T-Mobile License LLC and	) 0006867559, 0006868798, 0006869754,
Cellco Partnership d/b/a Verizon Wireless	) 0006869768, 0006869777, 0006869790,
and Certain of Its Subsidiaries	) 0006869871, and 0006869873

DECLARATION OF TERRENCE SMITH

1. My name is Terrence Smith. I am submitting this Declaration in support of the Consolidated Reply of Sirius XM Radio Inc. ("Sirius XM") to submissions made in this proceeding by T-Mobile License LLC ("T-Mobile") and by Cellco Partnership d/b/a Verizon Wireless and certain of its subsidiaries on August 26, 2015.
2. I am the Corporate Vice President and Chief Engineering Officer for Sirius XM. I have worked in senior engineering positions for Sirius XM and its predecessor Sirius Satellite Radio for more than 13 years. In my current capacity, in addition to supporting our regulatory efforts and interference concerns, I have responsibility for the design, implementation and operation of Sirius XM's broadcast and signal delivery infrastructure including its terrestrial repeater network.
3. At the invitation of the FCC, I presented in the Commission's March 2012 Workshop on Spectrum Efficiency and Receivers in a session on the Receiver Ecosystem and a session on Experiences and Lessons Learned.
4. Prior to joining Sirius XM, I held senior engineering positions at the David Sarnoff Research Center and Sarnoff Corp, where I led a team that helped develop the digital HDTV standard. I held several leadership positions in the FCC's Advisory Committee on Advanced Television Services to shepherd the effort of documenting the standard and resolving implementation concerns. I have served as the President of the IEEE's Consumer Electronics Society.
5. I hold a Bachelor of Science in Electrical Engineering from the University of Notre Dame and a Master's degree in Electrical Engineering from Drexel University. I hold sixteen US patents and have authored or co-authored numerous technical papers.
6. In response to reports of significant, new disruptions to the reception of the Sirius XM service in the New York metropolitan area, I caused my staff to commence an investigation into the cause in October 2014.

7. The investigation initially involved the deployment of test receivers, OEM-radio-equipped vehicles, and spectral mapping equipment to the areas of reported service disruptions.
8. The investigation confirmed the existence of significantly more disruptions to the reception of Sirius XM service than had been measured in prior years.
9. Given the absence of material changes in the Sirius XM network in recent years, the investigation focused on changes in the radiofrequency environment in the affected areas, including those related to the provision of AWS and PCS wireless service.
10. The spectral mapping equipment identified areas with very strong AWS and PCS on-ground signals that are generally understood as having the ability to combine to form intermodulation distortion in radio receivers that operate on frequencies licensed to Sirius XM. Because of the ways that third order intermodulation signals mathematically combine, I suspected that AWS signals might be a large contributor to the interference.
11. Among other things, Sirius XM staff measured the strength, at street level, of wireless base station emissions in the 1930-1950 MHz and 2135-2155 MHz bands at various locations in midtown Manhattan. I have been informed that those frequencies are licensed to T-Mobile in Manhattan.
12. Based on the October 7, 2014 measurements, my staff calculated the following values as the maximum T-Mobile base station power level at the output of an omnidirectional 0 dBi antenna that would generate the measured ambient street level signals:

Downlink Band	Maximum Power/10 MHz
1930-1950 MHz	-5 dBm
2130-2145 MHz	-9 dBm

13. Certain measured T-Mobile AWS base stations employ antennas at very low heights, including on the roofs of one-story buildings, significantly increasing the chance of high levels of signal strength at street level.
14. 3GPP standards for 4G LTE operations specify -25 dBm as the maximum input signal specification for the user terminal across the various channel bandwidths supported by the LTE standard.
15. The overall performance of the Sirius XM service has been designed with reference to the expected EIRP levels from AWS-1 and PCS base stations specified in 3GPP standards. Sirius XM receivers are 18 dB, or more than 60 times, more resilient to intermodulation interference than the requirement for 4G LTE handsets.
16. The measured power levels of the T-Mobile base station operations described above were approximately 16 to 20 dB, or about 40 to 100 times, higher than those in the 3GPP specification.

17. The measured power levels emitted on frequencies licensed to T-Mobile were materially higher than those measured on frequencies licensed to other wireless carriers.
18. Based on these considerations, the investigation identified intermodulation interference arising from T-Mobile's AWS operations as the primary source of the disruption to the Sirius XM service.
19. Sirius XM approached T-Mobile to discuss conducting tests that would further explore the conclusions of Sirius XM's investigation. In January 2015, Sirius XM engineers ran tests with T-Mobile engineers at selected T-Mobile base stations in the New York metropolitan area that measured the effects on the Sirius XM service of turning on and off T-Mobile AWS and PCS signals.
20. Because the testing occurred between 1 AM and 5 AM, customer traffic was much lower on the T-Mobile network than during peak traffic hours. As a result, the AWS signal levels were approximately 7 to 13 dB, or 5 to 20 times, lower than peak times. Nevertheless, strong T-Mobile wireless signal levels still were the source of disruption to the Sirius XM service in the vicinity of the tested base stations.
21. Whenever T-Mobile's AWS signal was turned off, the disruption to Sirius XM's service disappeared entirely. This occurred even when T-Mobile's PCS signal was still operating. As a result, I concluded that T-Mobile's high-powered AWS signal was the primary source of the disruption and that those signals were intermodulating with PCS transmissions from T-Mobile and others.
22. On February 3, 2015, I participated in a meeting among FCC staff and Sirius XM representatives in which we described the growing disruptions to the Sirius XM service, and discussed Sirius XM's analysis that showed T-Mobile as the source of the interference, and in which we sought the FCC's assistance in resolving the matter.
23. On June 18, 2015, I participated in a meeting requested by the FCC. This meeting included representatives of FCC staff, T-Mobile, and Sirius XM, during which the disruptions to the Sirius XM service were discussed. I described the intermodulation interference into Sirius XM receivers, caused by the higher-than normal, on-ground power levels of T-Mobile's AWS signals. I explained that the Sirius XM service was resilient to Verizon's AWS operations, which my staff had measured as occurring at substantially lower on-ground levels than T-Mobile's AWS transmissions. I indicated that the disruption from T-Mobile's AWS operations appeared to be growing, but that Sirius XM could not quantify the scope of the problem, predict the geographic areas where the problem would occur, or try to manage the problem, without full cooperation from T-Mobile. The cooperation we needed included information from T-Mobile as to when, where, and how T-Mobile intended to deploy networks using AWS spectrum, where T-Mobile's current AWS transmitters were located, as well as T-Mobile's agreement to conduct tests to determine at what T-Mobile signal levels the disruption to Sirius XM service starts to occur. I indicated that such information was not available from the Commission's databases, or any known source other than T-Mobile.

24. At the June 18, 2015 meeting, T-Mobile flatly refused to conduct tests that would identify the precise T-Mobile signal level that starts to disrupt the Sirius XM service. T-Mobile also said it would not even consider testing that could lead to technical changes in its network that T-Mobile did not deem acceptable. The only thing T-Mobile indicated it would test was whether the eventual phase-out of its 3G UMTS signal would improve the interference environment.
25. At the June 18, 2015 meeting, I explained that Sirius XM had been redesigning its receiver antennas to take into account recent changes in the radiofrequency operating environment related to AT&T's expected deployment on WCS frequencies, and that redesign also should render the radios more resilient to high-powered wireless base station signals from other wireless carriers such as AWS operators. I explained that these redesigned antennas had not yet been deployed. Since Sirius XM service is predominantly based on equipment pre-installed in vehicles, the new antennas would have to be integrated into the production cycles of new vehicles, and it would likely take almost a decade before a significant number of Sirius XM-equipped operating vehicles include this new antenna design. I explained that it would not be possible to make Sirius XM receivers fully resilient to T-Mobile's interference without some limits on the level of on-ground emissions that could be produced by such interference sources. I also explained that it is wholly impractical to retrofit existing vehicles with the redesigned Sirius XM antennas because of the way that equipment is integrated into the vehicle's internal and external design and the astronomical costs and logistical challenges involved in recalling millions of vehicles for this purpose.
26. At the June 18, 2015 meeting, I also answered questions about whether the deployment of additional Sirius XM terrestrial repeaters could mitigate the interference caused by T-Mobile. I explained that additional testing of that approach would be needed, especially since the Sirius XM system was licensed by the Commission and designed primarily as a satellite system with limited reliance on terrestrial repeaters. Moreover, significantly increasing use of repeaters presents an increased risk of self-interference in a single-frequency system such as Sirius XM's.
27. At the June 18, 2015 meeting, FCC staff indicated that the disruption to Sirius XM's service was an interference problem with no easy solution, and that relevant questions to be examined included which party should bear the cost of the solution. FCC staff directed both T-Mobile and Sirius XM to examine what they could do to solve the problem, conduct further discussions, and then return for a follow-up meeting with the FCC in approximately six weeks.
28. The next day, June 19, 2015, Sirius XM engineers contacted T-Mobile engineers as a follow up to the FCC meeting. Sirius XM engineers proposed a number of tests that could help bound and resolve the intermodulation interference, and reiterated those requests in an e-mail dated June 22, 2015. The only test that T-Mobile agreed to perform was one designed to ascertain whether the eventual phase-out of its 3G UMTS signal would improve the interference environment. That test was conducted and the result was that this phase-out would not remediate the interference to Sirius XM.

29. Despite Sirius XM's request to engage in further testing and explore other solutions, on June 23, 2015, T-Mobile reiterated its position that it "is operating in accordance with FCC requirements" and refused to consider potential solutions that did not "align with [its] network development roadmap." On June 24, 2015, my staff further encouraged T-Mobile to work with Sirius XM to "try to bound the problem from the technical side to enable a full discussion of possible solutions, even if there are business concerns with implementing some of those solutions." Mr. Sharkey responded that same day by saying "It does not make sense to spend resources exploring options that we know are not acceptable."
30. On June 24, 2015, I sent an e-mail to Mr. Sharkey with two information requests intended to enable Sirius XM to further understand and diagnose the causes of the intermodulation interference to the Sirius XM service, and to develop appropriate measures to address that interference. My e-mail requested (i) a detailed history of changes to T-Mobile's Manhattan base station sites from its maintenance logs, and (ii) a list of all locations where T-Mobile now has or intends to co-locate AWS and PCS transmitters operating within a range of identified frequencies that could combine to create intermodulation products in Sirius XM's frequency band. I offered to take appropriate steps to maintain the confidentiality of that information.
31. On June 30, 2015, I reiterated my June 24 request to Mr. Sharkey because he had not responded.
32. On July 7, 2015, I sent a third request to Mr. Sharkey asking for a timeframe within which T-Mobile would be able to provide some of the information Sirius XM had requested.
33. On July 10, 2015, Mr. Sharkey finally responded, declining to provide the information requested, because he summarily concluded that "LTE implementation was not a factor" in the interference Sirius XM is experiencing, and because "[i]nformation about our nationwide deployment plans is highly confidential, competitively sensitive and subject to change." Notably, Mr. Sharkey did not address whether other types of network changes could have been the source of the changed radiofrequency interference environment that the Sirius XM investigation in October 2014 had identified. Mr. Sharkey also made clear that T-Mobile was not interested in taking further steps to solve the problem, saying instead that Sirius XM should focus on finding a solution involving improving its radio receiver performance, or increasing its desired signal strength in certain areas.
34. On July 17, 2015, counsel for Sirius XM requested that the OET move ahead with the six-week follow up meeting that OET suggested during the June 18, 2015 meeting.
35. On July 28, 2015, Sirius XM met with representatives of OET and the Wireless Bureau to express its concerns about the absence of any progress with T-Mobile on the course of work recommended in the June 18, 2015 meeting, and to seek the FCC's assistance in encouraging T-Mobile's cooperation.

36. On August 11, 2015, Sirius XM filed its opposition to T-Mobile's proposed acquisition of a number of additional wireless licenses, the deployment of which will exacerbate the existing interference problem.
37. On August 20, 2015, OET proposed having the six-week follow up meeting on August 26, 2015. I am informed that T-Mobile declined the invitation to meet that day because it was working on a response to Sirius XM's August 11 opposition.

I, Terrence Smith, hereby declare under penalty of perjury, that the foregoing is true and correct to the best of my knowledge, information, and belief.


Terrence R. Smith

Executed on this 10th day of September, 2015

EXHIBIT 3: DECLARATION OF DR. MICHAEL J. MARCUS

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

In the Matter of	) ULS File Nos. 0006867447, 0006868438,
	) 0006868544, 0006867476, 0006867520,
Assignment Applications of	) 0006867467, 0006867470, 0006867545,
T-Mobile License LLC and	) 0006867559, 0006868798, 0006869754,
Cellco Partnership d/b/a Verizon Wireless	) 0006869768, 0006869777, 0006869790,
and Certain of Its Subsidiaries	) 0006869871, and 0006869873

DECLARATION OF DR. MICHAEL J. MARCUS

1) My name is Michael J. Marcus. I am submitting this Declaration in support of the Consolidated Reply of Sirius XM Radio Inc. ("Sirius XM") to the August 26, 2015 submissions in this proceeding of T-Mobile License LLC ("T-Mobile") and of Cellco Partnership d/b/a Verizon Wireless and certain of its subsidiaries.

2) I am an independent consultant in wireless technology and policy under contract to provide advice regarding Sirius XM in this matter. I previously worked at the FCC for nearly 25 years in senior positions in both spectrum policy and spectrum enforcement matters. During that period I proposed and directed the policy developments that are the foundation of today's Wi-Fi and Bluetooth. I also proposed and directed development of all the present millimeter wave licensed and unlicensed service rules above 59 GHz. From 1988 to 1991, I was the main point of contact between FCC and FAA for policy development on possible intermodulation interference between upper end FM broadcast stations and adjacent band Instrument Landing Systems. I was also active in internal FCC policy developments to resolve Nextel/public safety intermodulation interference problems in the 800 MHz band. My qualifications are well known

to the Commission.¹

3) I have undergraduate and doctorate degrees in electrical engineering from the Massachusetts Institute of Technology (MIT) and have taught electrical engineering courses at George Washington University, MIT, and Virginia Tech. As a Mike Mansfield Fellow, I worked for a year on an exchange program at the Commission's Japanese counterpart and have been a consultant to the Singapore regulator as well as the European Commission on spectrum policy issues. I was elected a Fellow of the Institute of Electrical and Electronics Engineers in 2004 "for leadership in the development of spectrum management policies" and was awarded the IEEE Communications Society Award for Public Service in the Field of Telecommunications in 2013 "for pioneering spectrum policy initiatives that created modern unlicensed spectrum bands for applications that have changed our world." I was chair of the IEEE-USA Committee on Communications Policy in 2012-13 and have been co-chair of the FCBA Engineering and Technology Practice Committee several times. I am a technically qualified person and am familiar with the rules and rulemaking proceedings related to interference for wireless communications services and satellite digital audio radio service.

4) There are several ways that radio systems can cause interference to each other including, for example, the more common co-channel interference and adjacent channel interference. There are two types of intermodulation interference: transmitter-generated and receiver generated. Transmitter generated intermodulation is not the issue here and only happens when multiple transmitters are located in close proximity such as on a ship or on a mountain top with a dense grouping of antennas like Los Angeles' Mt. Wilson. Intermodulation interference also regularly occurs in today's wireless network deployments in the form of active and passive

¹ http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-243463A1.pdf.

intermodulation.

5) In receiver-generated intermodulation, two strong signals interact in the receiver to create a new signal that is within the same frequency band as the desired signal (*i.e.*, is co-channel). The new signal created by the intermodulation is only in the receiver itself where it is generated by limitations in the receiver circuitry and cannot be detected externally, although the impact to receiver performance is just as real as an externally present interference signal. We will explain this situation with an analogy to fire. As shown in Figure 1, fire results from three simultaneous circumstances: the availability of heat, oxygen, and fuel – the “fire triangle:”

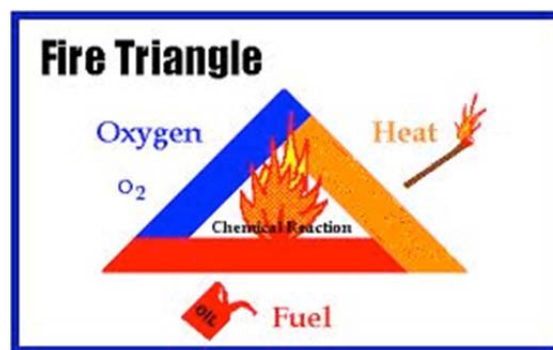


Figure 1: Fire Triangle

Similarly, intermodulation interference only occurs with the simultaneity of three conditions as shown in Figure 2:

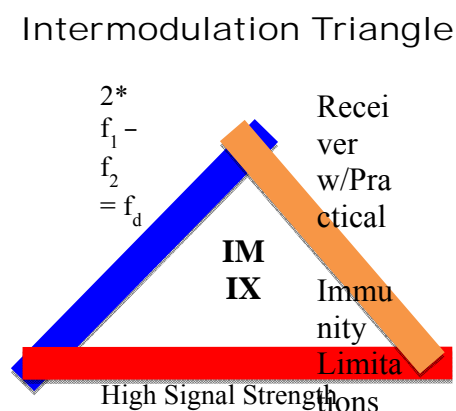


Figure 2: Intermodulation Triangle

These three conditions are:

- Two signals at frequencies f_1 and f_2 that have this relationship with the desired signal frequency f_d : $2 * f_1 - f_2 = f_d$
- A high signal strength from at least one of the signals contributing to the above equation
- A receiver with limitations in performance in the presence of such signals

6) As in the case of fire, eliminating one of these conditions will eliminate the problem. While T-Mobile claims that the only appropriate way to deal with such an issue is to address the receiver performance issue, independent of whether the necessary performance is practically achievable in the intended marketplace, the Commission over the decades has recognized that intrinsic receiver limitations are an integral part of spectrum policy and must be accounted for in its regulation even though theoretically “perfect” receivers would not suffer from such limitations. Thus just as the Commission has paid attention to near/far problems on adjacent channels resulting from practical limits on how much a given receiver can filter out such signals to make sure that receivers trying to receive weak signals do not have very strong signals on adjacent channels, the Commission on multiple occasions in multiple services has placed limitations on transmitter locations and transmit powers to prevent receiver-generated intermodulation in practical receivers that meet reasonable immunity standards.

7) The best known example of such an intermodulation prevention regulation is in the “UHF Taboos”² adopted in 1952³ when broadcast television moved into the UHF band.

² J.T. Dixon, “UHF-TV Taboos: The FCC Electromagnetic Compatibility Plan for UHF Television”, IEEE Trans. EMC, Vol. 6, No. 1, p. 29-32 (1964); FCC/OCE, “A Study of the Characteristics of Typical Television receivers Relative to the UHF Taboos”, 1974 (https://transition.fcc.gov/Bureaus/Engineering_Technology/Documents/reports/R2229-63.pdf); FCC/OET Technical Memorandum (Draft), “A Study of UHF Television Receiver Interference Immunities”. 1987 (https://transition.fcc.gov/Bureaus/Engineering_Technology/Documents/reports/TM87.pdf); FCC/OET, A Study of UHF Television Receiver Immunities”, 1989

Table II of § 73.698⁴ requires that a new TV transmitter 2, 3, 4, or 5 channels above or below an incumbent TV licensee's channel must be at least 19.4 miles or 31.4 km away from the incumbent licensee in order to prevent intermodulation in realistic receivers. This UHF Taboo example is probably the first precedent of the Commission limiting transmitter placement or power to prevent interference that results in realistic receivers with finite immunity to receiver-generated intermodulation interference. Note that the Commission did not seek to prevent intermodulation by mandating or implying the need for highly immune receivers. Rather, it made a reasonable projection about what was achievable in receiver performance and then created the taboos so that strong signals on frequencies capable of causing intermodulation did not occur.

8) The next example of intermodulation prevention is from the case of the adjacent FM broadcast bands and aeronautical Instrument Landing System (ILS) localizer band between 108.10 MHz and 111.95 MHz where transmitters are authorized by NTIA and operated by FAA. There has been concern in the aeronautical community that strong FM signals at the upper end of the FM band could result in intermodulation in safety-critical ILS receivers in aircraft. This issue was addressed by FCC/FAA cooperation prohibiting FM transmitters near airports if the transmitter was on a frequency that could combine with another nearby signal to form an intermodulation signal in an airborne receiver on the local ILS localizer signal. All new FM transmitter applications are reviewed by the FAA prior to FCC processing and the FAA objects to any location/frequency/power combinations that raise intermodulation threats in the airspace volume used for ILS at the affected airport. While The International Civil Aeronautics

(https://transition.fcc.gov/Bureaus/Engineering_Technology/Documents/reports/UHF_study_030289.pdf).

³ Sixth Report and Order, Dockets 8736,8975,8976,9175, 41 F.C.C. 148, (1952).

⁴ 47 C.F.R. § 73.698.

Organization (ICAO) has adopted standards for ILS immunity in aircraft receivers⁵, neither the FCC⁶ nor the FAA has made this immunity level mandatory for domestic aircraft operating in US airspace. Instead of creating such a mandate, this type of intermodulation is prevented by controlling the strength and frequency of FM stations near airports.

9) The Commission has explicitly addressed intermodulation interference caused by Part 27 licensees in § 27.64 which provides:

Wireless Communications Service (WCS) stations operating in full accordance with applicable FCC rules and the terms and conditions of their authorizations are normally considered to be non-interfering. If the FCC determines, however, that interference which significantly interrupts or degrades a radio service is being caused, it may, after notice and an opportunity for a hearing, require modifications to any WCS station as necessary to eliminate such interference.

...
(b) **Intermodulation interference.** Licensees should attempt to resolve such interference by technical means⁷.

Pursuant to §27.1(b)(8),⁸ AWS-1 operations are covered by this rule although PCS operations are not. Here again the Commission has not placed the burden on receivers to solve intermodulation problems but rather requires that transmitter licensees, including AWS licensees, must work with affected parties to solve the problem and has reserved the right to order “modifications to any [AWS] station as necessary to eliminate such interference.”

10) In its Second Reconsideration Order in IB Docket No. 01-185,⁹ the Commission addressed the issue of possible receiver generated intermodulation interference in Inmarsat

⁵ ICAO Annex 10 to the Convention on International Civil Aviation, Volume I – Radio Navigation Aids, Section 3.1.4 Interference immunity performance for ILS localizer receiving systems (2006).

⁶ FCC did propose this in Docket 93-199 but never acted on its proposals.

⁷ 47 C.F.R. § 27.64.

⁸ 47 C.F.R. § 27.1(b)(8).

⁹ *Memorandum Opinion and Order and Second Order on Reconsideration*, Docket 01-185, February 25, 2005, at ¶¶ 58 – 60.

mobile earth terminal receivers (METs) from new terrestrial ATC transmitters operated by Mobile Satellite Ventures Subsidiary LLC (MSV). The Commission resolved this issue as follows:

To resolve third-order intermodulation problems, we require any MSS/ATC operator to notify the affected MSS operator in any case where a single base station or multiple base stations will transmit on frequencies that can produce third-order intermodulation products that overlap a frequency assigned to the affected MSS operator in the 1525-1559 MHz band, where such transmissions will result in a signal level of -70 dBm or higher for the combined signals at the output of the affected MSS operator's terminal's receiving antenna. The MSS/ATC operator and the affected MSS operator must work together to resolve the interference problem. We note that careful selection of base station frequencies by the MSS/ATC operator can minimize the number of situations in which this problem will arise, as could aggregating the channels used by the different MSS operators through the coordination process.¹⁰

Again the Commission required that the parties involved work out a mutually acceptable technical solution and did not place the whole burden of solving the intermodulation issue on the affected receiver.

11) In a statement filed in Docket 07-193 on SDARS/WCS coexistence in nearby bands, Dr. Theodore Rappaport, then from University of Texas but now with New York University, described the fundamental differences between broadcast services and mobile networks such as WCS and the PCS and AWS-1 networks operated by T-Mobile.¹¹ Dr. Rappaport describes the Sirius XM system as follows:

Both the legacy Sirius and XM satellite signal power levels are relatively weak as compared to modern terrestrial mobile and fixed wireless systems. For example,

The XM satellite power level received before the receiver antenna in Miami, FL is -102.6 dBm over a 1 MHz bandwidth. In the Northern Virginia/Washington DC area, the XM satellite provides a signal that is stronger than the Miami signal by about 8 dB, or -94.6 dBm over a 1 MHz bandwidth, in clear sky.

¹⁰ *Ibid* at ¶ 59.

¹¹ Supplemental Comments of Sirius XM Radio Inc., Docket 07-293, Attachment: "Technical Analysis of the Impact of Adjacent Service Interference to the Sirius XM Satellite Digital Audio Radio Services (SDARS)" by Dr. Theodore Rappaport, April 29, 2010 (<http://apps.fcc.gov/ecfs/document/view?id=7020442790>).

The average Sirius satellite power level received in Miami is -101 dBm per 4 MHz, and it is -99 dBm in clear sky in the Northern Virginia/DC area, which is equivalent to -107 dBm and -105 dBm over a 1 MHz bandwidth, respectively.

The thermal noise level of the protected SDARS spectrum, without WCS interferers, was measured by Florida Atlantic University to be -113 dBm over a 4 MHz bandwidth. Note that this -113 dBm satellite radio noise floor measured over a 4 MHz bandwidth corresponds to -119 dBm noise floor level over a 1 MHz bandwidth.¹²

Rappaport goes on to contrast this with mobile wireless systems

In contrast to satellite systems, cellular and fixed wireless systems are designed to operate in an interference-limited, rather than noise-limited, environment since many base stations and subscriber stations transmit on the same frequencies within a geographic region. The received signal levels at subscriber units within a cellular coverage area vary by several orders of magnitude, but are always at much stronger power levels than the signals received by satellites. This wide dynamic range of signals is due to the large proportional variations in distances between subscribers and a base station.¹³

The strength of mobile wireless downlink signals from base stations is illustrated in the following diagram submitted by Motorola in 2002 when the company was active in both the base station and the mobile telephone markets:

¹² *Ibid.* at p. 15 (references omitted).

¹³ *Ibid.* at p. 12.

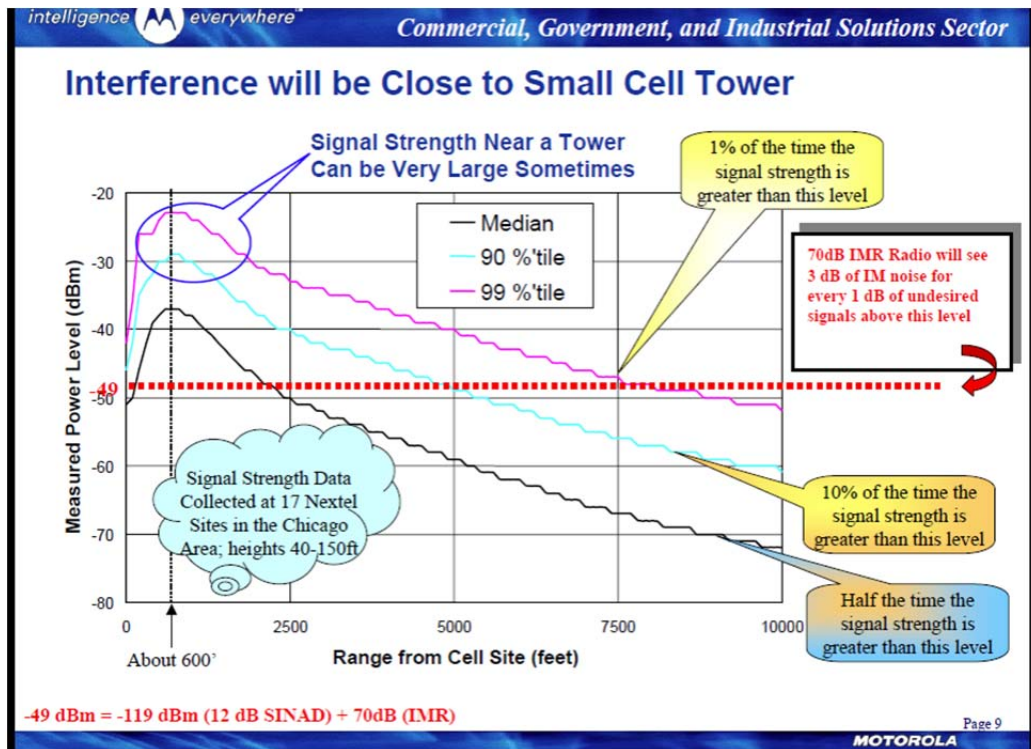


Figure 3: Signal strength data from Motorola Docket 02-55 presentation¹⁴

The Motorola diagram explicitly states “Signal strengths near a cellular tower can be very large sometimes.” This is well known throughout communications industry, and is consistent with the statements of Dr. Rappaport above. The Sirius XM system was designed with this in mind. However, also note the numerical scales shown in the diagram: the 99 percentile line is shown to peak at about -23 dBm while the 90 percentile line peaks at about -29 dBm. Wireless devices generally work for signals as low as -90 dBm, off the bottom edge of the chart. The very strong signals at about -30 dBm do not directly help the carrier or its customers but can adversely impact other spectrum users.

12) How much responsibility exists to use receivers robust enough to be invulnerable to receiver-generated interference in the presence of reasonably expected strong signals from

¹⁴ Letter from Steve B. Sharkey, Motorola to Marlene H. Dortch, Docket 02-55, October 31, 2002 at slide 9 (.pdf page 10).

mobile wireless base stations? Today's CMRS operators such as T-Mobile generally follow standards developed by the 3rd Generation Partnership Project (3GPP)¹⁵, a group of national and regional standards bodies. The 3GPP standard¹⁶ gives an upper bound for the signal strength that mobile wireless equipment is expected to work in. Table 7.4.1-1 from this standard (shown below) gives the maximum expected signals:

Table 7.4.1-1: Maximum input level

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Power in Transmission Bandwidth Configuration	dBm	-25					
Note:							
1.	The transmitter shall be set to 4dB below $P_{\text{CMAX,L}}$ at the minimum uplink configuration specified in Table 7.3.1-2 with $P_{\text{CMAX,L}}$ as defined in clause 6.2.5.						
2.	Reference measurement channel is Annex A.3.2: 64QAM, R=3/4 variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.						

Table 1: Maximum signal strengths 3GPP standard Table 7.4.1-1

This number is consistent with the information from Motorola previously discussed. A reasonable expectation for maximum signal strengths near a wireless base station is in the range of -25 to -30 dBm.

13) A test manual from National Instruments (NI), a major provider of test equipment for the communications industry, discusses “Maximum Input Level” for LTE equipment which “characterizes the receiver’s ability to achieve minimum requirements for throughput under extreme signal level conditions.”¹⁷ NI gives the maximum input level requirement for LTE

¹⁵ <http://www.3gpp.org/about-3gpp/partners>.

¹⁶ 3GPP, LTE; Evolved Universal Terrestrial Radio Access (E-UTRA) (3GPP TS 36.300 version 8.4.0 Release 8), ETSI TS 136 300 V8.4.0 (2008-04); User Equipment (UE) radio transmission and reception (3GPP TS 36.101 version 10.3.0 Release 10), ETSI TS 136 101 V10.3.0 (2011-06).

¹⁷ National Instruments, Introduction to LTE Device Testing -From Theory To Transmitter and Receiver Measurements” at p. 63.

receivers based on 3GPP standards as -25 dBm for bandwidths of 1.4 to 20 MHz.

A third source for maximum signal level expectations is a recent textbook that states:

For UMTS the maximum and minimum wanted signal powers are -44 and -117 dBm respectively, giving a dynamic range of 73 dB. For an LTE UE, the maximum input is -25 dBm (assumed to be applicable to any modulation), while the minimum signal level for a 5 MHz bandwidth is -100 dBm (minimum REFSENS value across the different bands), giving a maximum dynamic range of 75 dB.¹⁸

Thus -25 dBm is a commonly used number for the maximum signal to be expected in operational use in mobile wireless systems.

14) According to Commission records, T-Mobile (dba T-Mobile Licensee LLC) holds licenses for the following PCS and AWS-1 bands in Manhattan/New York County:

Frequency (MHz)	License Call Sign
1930 – 1945	KNLF202
1945 – 1950	KNLF982
2130 – 2135	WQGA725
2135 – 2140	WQGA731
2140 – 2145	WQGB373
2145 – 2155	WQPZ969

Table 2: T-Mobile Licensee LLC licensed spectrum that covers Manhattan

T-Mobile controls 1930-1950 MHz and 2130-2155 MHz in Manhattan under six different licenses. Sirius XM's staff measured the strength of these signals at street level in parts of Manhattan on October 7, 2014. The numbers shown below are the power that the ambient street level signal would create at the output of an omnidirectional 0 dBi antenna. These figures have a measurement error of ± 3 dB.

(http://download.ni.com/evaluation/rf/Introduction_to_LTE_Device_Testing.pdf)
(emphasis added).

¹⁸ S. Sesia, *et al.*, *LTE – The UMTS Long Term Evolution From Theory to Practice - Second Edition*, Wiley, 2011, at p. 491.

T-Mobile Manhattan Downlink Band	Maximum Power in 10 MHz channel
1930-1950 MHz	-5 dBm
2130-2145 MHz	-9 dBm

Table 3: Maximum T-Mobile downlink signal strengths measured by Sirius XM in Manhattan on October 7, 2014

15) T-Mobile is operating its base stations at power levels that are approximately 16-20 dB stronger than, or about 40 -100 times greater than, the power levels specified in relevant industry standards. Figure 4 below shows that at present the strongest PCS and AWS-1 signals from T-Mobile (shown in red) are emitted from base stations at a number of locations in midtown Manhattan. Reducing these street level signals would not impact the whole T-Mobile network in New York City or elsewhere.



Figure 4: Distribution of very strong street level signals from T-Mobile in Manhattan

16) It is unclear why T-Mobile base stations are creating such strong signal strengths at street level in these areas, especially considering that this is rare for other carriers and in other cities. The following photograph of the interfering T-Mobile base station shows that the cause is a combination of unusually low antenna locations combined with radiating antennas that may not have been intended for such a low height.



Figure 5: T-Mobile base station site on 45th St and 3rd Avenue, Manhattan that is a source of interference to Sirius XM

The antennas at this location are mounted on the top of a one-story building. These antennas were not intended to be mounted at such a low height. Regardless whether they do or do not meet current FCC limits on effective isotropic radiated power and RF safety limits, the high power at street level serves no constructive purpose to T-Mobile and is inconsistent with industry practice. The power level on the street is approximately a billion times the level at which a mobile wireless service can provide service. T-Mobile may prefer to use high e.i.r.p. to penetrate offices within the higher buildings across the street, but this same result can be accomplished

with alternative antenna designs that do not illuminate the street with such high signals. T-Mobile can easily adjust the downtilt of the existing antennas to decrease street illumination and place more of the transmitter power in the direction of the buildings where it may be needed. Any of these scenarios, and possibly others, should be fully explored in an effort to eliminate the harmful interference being created.

17) Again, it can be seen from this data that T-Mobile's downlink signal at street level is at least 20 dB stronger than the 3GPP standard in the PCS band and 16 dB in the AWS-1 band. Returning to the fire analogy, intermodulation interference only happens if three conditions are simultaneously met. Table 4 shows that the specific bands licensed to T-Mobile in Manhattan/New York County for the licenses given in Table 2 clearly meet the first condition. They can produce an intermodulation signal in a receiver if they are strong. In particular, the red and pink boxes in Table 4 show the specific frequencies where the combination of strong PCS signals and strong AWS-1 signals create intermodulation products in the Sirius XM SDARS band. From the available data, T-Mobile base station power levels are providing the heat that ignites the fire and causes the intermodulation.

		AWS-1 Band Licensed to T-Mobile					
Band	Freq. 1/2	2130	2135	2140	2145	2150	2155
PCS Band Licensed to T-Mobile	1930	2330	2340	2350	2360	2370	2380
	1935	2325	2335	2345	2355	2365	2375
	1940	2320	2330	2340	2350	2360	2370
	1945	2315	2325	2335	2345	2355	2365
	1950	2310	2320	2330	2340	2350	2360

Legend of IM3 combinations who's products fall on	
	Immediate SDARS band
	Partial SDARS band
	Over WCS band
	Over AFFTRAC band

Table 4: PCS and AWS frequencies licensed to T-Mobile in Manhattan and their potential to generate intermodulation products in Sirius XM's band

18) I have shown above that the Commission has often decided to deal with preventing intermodulation interference by either limiting the exact frequencies that are strong in a given area or limiting the power of signals that have the right mathematical relationship to create intermodulation in receivers that have practical limitations to their rejection on signals in nearby bands. The base station power levels that T-Mobile employs for PCS and AWS frequencies in the New York City metropolitan area create signals in some locations that significantly exceed wireless industry standards for T-Mobile's own receivers.

19) In another proceeding before the Commission, T-Mobile commented on the practical ability of realistic receivers for consumers to reject other out-of-band signals saying:

[T]here are practical physical limits to the ability of mobile receive filters to eliminate adjacent-band interferers that are very strong and very close spectrally. No perfect filter exists; therefore no filter can reject all adjacent-band signals.¹⁹

T-Mobile went on to state "The FCC's failure to develop sufficient interference protections fatally undermines the lawfulness of its proposed rules."²⁰ In a separate pleading T-Mobile talked about the interference in question specifically coming in part from transmission in adjacent bands and causing interference to their receivers:

The results confirmed what T-Mobile feared — the use of the AWS-3 band for mobile operations will create insurmountable interference to mobile operations in adjacent bands due to out-of-band emissions ("OOBE"), receiver overload, and blocking.²¹

While the interference that T-Mobile was concerned about in that proceeding was not literally receiver-generated intermodulation as in the case of Sirius XM's concern here, "receiver overload" and "blocking" are very closely related and also result from practical limits in a receiver on rejecting nearby strong out-of-band (OOB) signals and the inevitable nonlinearities

¹⁹ Comments of T-Mobile USA, Inc., Dockets 07-195 and 04-356, July 25, 2008 at p. 12 <http://apps.fcc.gov/ecfs/document/view?id=6520035718>.

²⁰ *Ibid* at p. 25.

²¹ Reply comments of T-Mobile USA, Dockets 09-175 and 04-356, August 11, 2008 at p. 4.

in receiver circuitry. These two interference mechanisms do not require two separate strong OOB signals to be present, but otherwise are very similar to the Sirius XM interference.

20) The Sirius XM receivers were engineered with the expectation of rejecting PCS and AWS-1 signal strengths that could be reasonably expected, based on 3GPP standards. The current Sirius XM antenna and low noise amplifier (LNA) system in its receivers were designed and tested to provide at least 65 dB of rejection in the SDARS band for inputs of 1883 and 1433 MHz at a strength of -35 dBm. Sirius XM testing of current antenna/LNA equipment shows that it functions properly with PCS and AWS-1 signals as high as -28 dBm/10 MHz. The next generation of antennas and LNAs are designed to meet a higher specification—a minimum of 80 dB of rejection in the SDARS band when presented with -35 dBm signals at 2155 MHz and 1975 MHz. That next-generation equipment, was developed after the 2012 changes in the Commission Rules concerning the adjacent WCS band, and, in the best case, is expected to start being integrated into new automobiles in about three years.²²

21) The Sirius XM system design also includes a “time diversity” feature in order to prevent loss of receive signal when the satellite is blocked from the receiver by an overpass or other physical obstruction. If the duration of the blockage is less than four seconds there is no lost audio than can be perceived by the user. Because of these design features of the Sirius XM service, small areas of high wireless signal strength do not necessarily disrupt service, but large areas of high signal strength at street level as are presently encountered in a number of New York City metropolitan area locations will overwhelm the capability of the time diversity feature

²² Mobile wireless equipment is actually much less immune to receiver-generated intermodulation than Sirius XM’s units are. LTE equipment is typically tested only for spurious signal levels up to -46 dBm. Admittedly, such equipment is generally operated in an environment without strong signals at frequencies that could lead to receiver-generated intermodulation interference. (National Instruments, Introduction to LTE Device Testing -From Theory To Transmitter and Receiver Measurements at p. 74).

and result in harmful interference to the Sirius XM user. Note that the issue here is high signal strength at street level. A new effective isotropic radiated power limit (e.i.r.p.) is not needed to prevent this interference. Power radiated that does not impact street level power would have no impact on Sirius XM and its subscribers.

22) Mobile wireless receivers typically can work with signals as low as -90 dBm, almost a billion times less than the T-Mobile signals Sirius XM has measured at street level. While, as we quoted Dr. Rappaport above, wide variation in cellular signal strength is inevitable throughout the service area, the extreme variability now seen at a number of sites in the New York City metropolitan area is unprecedented in the communications industry. T-Mobile apparently believes that this extreme variability is permitted by present Commission regulations and policy although the explicit provisions of § 27.64 obligate T-Mobile to address the consequences of its decision. Limiting T-Mobile street level signals to approximately the same level given for mobile wireless receivers in the 3GPP standard would adequately protect Sirius XM operations and would also be helpful to other wireless licensees as well as both federal and nonfederal users in nearby bands.

23) Ultimately SDARS receivers need some assurance of the maximum CMRS signals they will confront at street level, at least on a probabilistic basis. The current T-Mobile practice in the New York City metropolitan area as indicated in Sirius XM's measurements above shows that T-Mobile is changing the spectrum environment that has been stable for at least a decade. The Commission has long recognized that receiver-generated intermodulation is a complex problem that has to be controlled by addressing various factors. This interference to the Sirius XM system can be controlled by limiting the signal strength at street level to the numbers that have been stated in the 3GPP standard and which have been common in CMRS

practice. If high levels are needed at the windows of high rise office buildings near base stations then that can be achieved by using more appropriate antenna design and possibly alternative siting of base stations.

24) The unusually high signal strengths now encountered at the locations described above are providing no positive benefits to T-Mobile and its customers and instead are adversely impacting Sirius XM's service to consumers. While the impact seems to be limited in geographic scope for now, the continued and unrestricted growth of base stations with such unprecedented strong signal strength at street level could be devastating to Sirius XM's service and its customers. A return to the *status quo ante* coupled with a long term limit on street level field strengths based on consensus development among affected parties would be an approach to resolve this matter consistent with past Commission practice.

25) Sirius XM does not need a hard universal limit on signal strength at street level that applies in every square meter of FCC jurisdiction in order to limit the harmful interference resulting from T-Mobile's new and unprecedented approach to base station design – as reflected in the sites identified above. Illumination hotspots of a few meters in size can be accommodated by the time diversity built into the present Sirius XM system design. Non-collocation of PCS and AWS-1 antennas with high e.i.r.p. towards the street would also help in that this would avoid collocated hotspots in both bands. (Although the issue of how strong the weaker band's signal can be in the presence of a very strong signal from the other band will require additional testing since intermodulation is highly nonlinear.)

26) The recent and sudden large increase in T-Mobile's signal strength at street level in areas within the New York City metropolitan area threatens all nearby spectrum users if left unchecked.

* * * * *

I, Dr. Michael J. Marcus, hereby declare under penalty of perjury, that the foregoing is true and correct to the best of my knowledge, information, and belief.

/s/ Dr. Michael J. Marcus
Dr. Michael J. Marcus

Executed on this 11th day of September, 2015

CERTIFICATE OF SERVICE

I, Jarrett S. Taubman, hereby certify that on this 11th day of September, 2015, I caused a true and correct copy of the foregoing "Consolidated Reply of Sirius XM Radio Inc." to be served upon the following, via first-class mail, postage prepaid (except as otherwise indicated):

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