

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

In the Matter of)	
)	
Technological Advisory Council Spectrum)	ET Docket No. 17-340, DA 17-1165
Policy Recommendations)	

COMMENTS OF SIRIUS XM RADIO INC.

Sirius XM Radio Inc. (“Sirius XM”) submits these comments in response to the public notice issued by the Commission’s Office of Engineering and Technology on December 1, 2017 in the above-captioned proceeding (the “Public Notice”).¹ The Public Notice seeks comment on spectrum management principles recommended by the Technological Advisory Council (“TAC”) in its *Basic Spectrum Principles White Paper*.² Among other things, the Public Notice asks whether and how these principles should be integrated into Commission spectrum policy.³

Sirius XM appreciates the opportunity to provide its views on these matters. Sirius XM operates a subscription audio service in the Satellite Digital Audio Radio Service (“SDARS”) band. Sirius XM’s service relies principally on satellites, which cover the entire continental United States (CONUS) and serve receivers that are located wherever entertainment is provided and primarily installed in automobiles and other vehicles. The SDARS band is in the unique situation of being surrounded on both sides by spectrum allocated to the Wireless

¹ See *Office of Engineering and Technology Seeks Comment on Technological Advisory Council Spectrum Policy Recommendations*, Public Notice, ET Docket No. 17-340, DA 17-1165 (Dec. 1, 2017) (“Public Notice”).

² See FCC Technological Advisory Council, *Basic Principles for Assessing Compatibility of New Spectrum Allocations: A White Paper* (Dec. 11, 2015), available at <https://transition.fcc.gov/bureaus/oet/tac/tacdocs/meeting121015/Principles-White-Paper-Release-1.1.pdf> (“*Basic Spectrum Principles White Paper*”).

³ Public Notice at 6.

Communications Service (“WCS”), a terrestrial service permitting high-powered transmissions. The SDARS band is also proximate to bands allocated to the Personal Communications Service (“PCS”) and the Advanced Wireless Service (“AWS”), which similarly permit high-powered terrestrial transmissions. An operating environment where spectrum used for low-power satellite reception is sandwiched between higher-powered terrestrial bands presents extraordinary spectrum management challenges—especially with respect to potential (and actual) interference from out-of-band emissions (“OOBE”) and intermodulation into the SDARS band.⁴

Sirius XM struggles to address these challenges by working closely with operators in these bands to develop and implement creative solutions, relying on coordination agreements, the SDARS “harmful interference” definition⁵ and other aspects of the Commission’s rules, and the efforts of technical personnel. Based on this experience, Sirius XM is convinced that, when it comes to spectrum management, the Commission should not adopt universal, or “one-size-fits-all,” rules. There is no simple solution to complex spectrum management issues, as many potential interference and coordination situations involve technical, legal, practical, and policy factors that are unique to each band and must be taken into consideration, especially when it comes to receiver design and resistance to interference. Sirius XM urges the Commission to ensure that any spectrum management principles it adopts continue to leave ample room for case-by-case evaluation of these factors, based on concepts discussed herein, Commission precedent, and the unique needs of particular licensed services.

⁴ Although the Public Notice does not propose address allocation principles *per se*, sound spectrum management suggests that spectrum should be allocated in “neighborhoods” so as to preclude inconsistent low-power/high-power usage in adjacent bands of the type described herein.

⁵ See 47 C.F.R. § 27.64(d) (defining harmful interference to SDARS operations requiring resolution based on a WCS transmitter’s ground signal levels).

I. THE COMMISSION SHOULD ESCHEW ANY “ONE-SIZE-FITS-ALL” APPROACH TO SPECTRUM MANAGEMENT

The TAC’s *Basic Spectrum Principles White Paper* identifies nine principles intended to facilitate more efficient and effective spectrum use.⁶ The *White Paper* explains that the TAC does not expect the application of these principles to result in a concrete set of regulations that fit all radio services in the same way, due to the many differences between the requirements of various types of systems.⁷ That said, the *White Paper* also expresses the TAC’s belief that “the principles can be applied to all systems and result in an optimal solution for each service.”⁸

While the TAC may desire to provide greater structure to spectrum management policy, the complexities of spectrum management cannot be reduced to a limited set of “universal” principles. Sound spectrum management demands careful analysis of multiple factors and interests, which must be balanced against each other on a case-by-case basis. Given the complexity of this analysis, no single set of principles would reliably produce outcomes that are effective, efficient, equitable, and consistent with the applicable legal and policy framework. It would be particularly dangerous for the Commission to attempt to develop generalized, bright-line rules as to which class of operator (*i.e.*, the transmitter or the receiver) is presumed to be “responsible” for interference in all circumstances; in reality, any performance expectations with respect to receivers must be coupled with restrictions on appropriate signal levels at the receive antenna. Notably, placing primary responsibility on receivers would directly contradict

⁶ Public Notice at 3.

⁷ *Id.*

⁸ *Id.*

Commission precedent, which appropriately reflects the need for transmitters and receivers to share responsibility for interference avoidance.⁹

II. THE PROPOSED PRINCIPLES REGARDING THE “RESPONSIBILITIES OF SERVICES” ARE UNCLEAR

Apart from the broad concerns raised above, Sirius XM has particular concerns stemming from the underspecified nature and interrelationship of certain principles proposed by the TAC—namely, the series of recommended principles that seek to specify the relative “responsibilities” of transmitting and receiving spectrum users. These principles include:

- Principle #4: “Receivers are responsible for mitigating interference outside their assigned channels;”
- Principle #5: “Systems are expected to use techniques at all layers of the stack to mitigate degradation from interference;” and
- Principle #6: “Transmitters are responsible for minimizing the amount of their transmitted energy that appears outside their assigned frequencies and licensed areas.”

As discussed below, these principles do not reflect the legal regime established by the Communications Act and the Commission’s implementing regulations, are not detailed enough to provide meaningful guidance with respect to technical matters, and ignore relevant and critical equitable considerations.

⁹ See, e.g., *Fixed and Mobile Services in the Mobile Satellite Service Bands at 1525-1559 MHz and 1626.5-1660.5 MHz, 1610-1626.5 MHz and 2483.5-2500 MHz, and 2000-2020 MHz and 2180-2200 MHz*, 26 FCC Rcd 5710, ¶ 28 (2011) (recognizing that responsibility for interference abatement lies with both transmitters and receivers). To its credit, the TAC appears to acknowledge that it would be inappropriate to adopt a “one-size-fits-all” set of regulations, *Basic Spectrum Principles White Paper* at 4, but it nonetheless advocates adopting a “one-size-fits-all” set of principles. In either case, an approach to spectrum management that discounts case-by-case scenarios and the needs of particular services is inappropriate and impractical.

A. Any Principles Regarding Responsibilities of Services Should Reflect the Applicable Legal Framework

The proposed principles regarding “responsibilities of services” do not seem to reflect the spectrum management framework established in the Communications Act and the Commission’s implementing rules and policies. That legal framework specifies non-technical factors that the Commission must consider in allocating spectrum and resolving potential conflicts with respect to spectrum use. Critically, these factors suggest outcomes that are directly at odds with those suggested by the proposed TAC principles. For example:

- The Commission has long embraced policies that prioritize different spectrum uses based, at least in part, on when the relevant facilities were licensed or deployed. This “first-in-time” principle has provided certainty and encouraged investment in networks and services, inuring to the great benefit of the public.¹⁰ The approach is ignored in the Principle #4, which would appear to make receivers that have been in the field for years responsible for mitigating interference caused by newly deployed transmitters across all circumstances and conditions.
- The United States Table of Frequency Allocations, codified at Section 2.106 of the Commission’s rules, incorporates: (i) “primary” allocations, which allow users to operate on a priority basis as long as such operations are consistent with the Commission’s rules; and (ii) “secondary” allocations, which allow users to operate on a “non-interference” basis with respect to stations of a primary service. Among other things, this means that a secondary station (including a secondary transmitter) must not cause harmful interference to a primary station (including a primary receiver).¹¹ This result appears to be at odds with Principle #4, which suggests, without qualification, that “[r]eceivers are responsible for mitigating interference outside their assigned channels,” regardless of the requirements otherwise imposed on the transmitter by the Commission’s rules and policies (which are generally consistent with relevant allocations).
- The Commission’s rules and policies also reflect a critical distinction between licensed and unlicensed operations. Section 15.5(b) of the Commission’s rules provides that unlicensed devices must operate subject to the conditions that such devices: (i) do not cause harmful interference to others and (ii) accept all interference

¹⁰ See, e.g., 47 C.F.R. § 2.105(c) (allowing secondary users to claim protection from other secondary users whose frequencies are assigned at a later date).

¹¹ See 47 C.F.R. § 2.105(c).

from licensed stations.¹² Again, this is not reflected in Principle #4, which could be read as making *licensed* receivers responsible for mitigating interference caused by *unlicensed* transmitters, again without qualification.

To the extent the Commission is otherwise inclined to adopt some version of the proposed principles, it should modify them to ensure that they are consistent with the applicable legal framework—which would also better serve the public interest.

B. Any Principles Regarding Responsibilities of Services Should Provide Adequate Technical Guidance

The proposed principles regarding “responsibilities of services” are too vague to provide meaningful guidance to interested stakeholders with respect to technical matters. At the same time, the principles as currently drafted could easily be interpreted in a manner leading to outcomes that are ineffective and inefficient from a technical perspective.

For example, Principle #4 suggests that receivers should be “responsible for mitigating interference outside their assigned channels.” As an initial matter, the meaning of the phrase “outside their assigned channels” is far from clear. Notably, out-of-band emissions (“OOBE”), by definition, originate “outside” the assigned channels of the victim receiver. But requiring receivers to mitigate OOBE interference, no matter the level, would lead to absurd results and significantly impair receivers’ operations and ability to serve end users—a result that would reflect both ineffective and inefficient spectrum use. Even if the TAC intended for Principle #4 to say something akin to: “Receivers are responsible for mitigating interference outside their assigned channels *where the transmissions generating interference are within whatever*

¹² See 47 C.F.R. § 15.5(b).

parameters the Commission deems reasonable,” this formulation begs the question of what is “reasonable”—precisely the question the Commission must resolve on a case-by-case basis.¹³

Principle #4 could instead be interpreted to refer to overload interference and suggest that receivers must employ frequency guard bands sufficient to avoid receiving unwanted energy from other bands. But this interpretation begs the question of how much unwanted energy the receiver should reasonably be expected to reject in this fashion. Furthermore, if Principle #4 were about overload, this would leave significant gaps in the coverage of the proposed principles, as the TAC would not have provided any guidance with respect to OOB and intermodulation interference.

Similarly, Principle #5 establishes a broad expectation that “systems” should “use techniques at all layers of the stack” to mitigate degradation from interference. This principle in its current form is also underspecified, in that it: (i) provides no threshold for determining when cognizable “degradation” has occurred; (ii) does not specify whether the transmitter or receiver should be primarily responsible for mitigating such degradation in any given case; and (iii) provides no guidance as to how operators should balance the desire to mitigate degradation against the resulting loss in system efficiency of capacity—*i.e.*, how much mitigation is “enough.” Consequently, Principle #5 in its current form provides scant assistance in resolving any real-world spectrum management challenge.

Moreover, the principles individually appear to contradict each other in significant respects. For example, Principle #4 would make receivers responsible for mitigating interference “outside their assigned channels,” while Principle #5 would seemingly make all parties

¹³ Whatever standard of reasonableness is ultimately used should be specified in terms of the transmitter’s power as measured at the receiver, rather than at the transmitter. The Commission recognized as much when it defined harmful interference in the WCS/SDARS context. *See* 47 C.F.R. § 27.64(d).

responsible for mitigating such interference. The result is that, in order to apply the proposed principles in any given case, the Commission would need to engage in the same type of complex case-by-case analysis it engages in today, underscoring the need for significant modification and clarification before the proposed principles could be adopted.

C. Any Principles Regarding Responsibilities of Services Should Account for Equitable and Practical Considerations

In addition to the technical and legal issues discussed above, the proposed principles regarding “responsibilities of services” do not account for equitable and practical factors that should inform sound spectrum management policy. Among other things, the Commission should encourage efficient and effective spectrum use, adopting principles that provide certainty and encourage investment by licensees, equipment manufacturers, and network operators.

For example, in balancing the interests of adjacent operators, the Commission has historically considered how the expectations of the parties may have evolved over time and whether those expectations were reasonable. As a general matter, the Commission recognizes the desirability of protecting incumbent operations where networks and facilities were designed and deployed in a manner reasonably accounting for the expected operating environment. Principle #4 ignores this longstanding approach, and instead appears to suggest that receivers should be responsible for mitigating interference in all cases, without considering whether receiver manufacturers reasonably accounted for the expected interference environment when they designed their devices. A receiver cannot be designed to effectively protect against interference unless the designer knows or can reasonably anticipate the interference environment in which the receiver is being designed to operate. For this reason, any performance expectations with respect to *receivers* must be coupled with expectations of allowable signal strength *at the receiver’s antenna*.

Nor does Principle #4 account for critical distinctions between different types of receivers and their associated development cycles. For example, receivers intended for pre-installation in automobiles and other vehicles must be designed and provided to the automaker years in advance of the vehicle's manufacture. Once the vehicle is sold to the initial buyer, the receiver is essentially fixed, such that it becomes impractical to replace or upgrade the device throughout the vehicle's approximately ten-year useful life. Licensees in these services, such as Sirius XM, therefore endeavor to design their receivers in a manner that anticipates the foreseeable spectrum environment years in the future. In contrast, wireless handsets are not pre-installed in a larger product and are replaced far more frequently, typically every 24-36 months. Consequently, it is far simpler to expect a wireless handset manufacturer will design its radio guarding against interference threats foreseen during the device's useful lifetime than for the manufacturer of devices installed in vehicles to anticipate environment changes over the device's expected life.¹⁴

In the context of vehicle-installed receivers, any requirement that manufacturers adjust to unforeseeable changes in the interference environment would require them to either: (i) anticipate and account for a panoply of specific, *potential* emergent uses in adjacent bands (requiring accurate predictions of spectrum usage, future technology, and technical standards 10-15 years down the road); or (ii) somehow change the performance characteristics of equipment deployed in consumers' vehicles, requiring a complex and impractical retrofitting program that would realistically address only a small part of the installed equipment base.

¹⁴ In the case of SDARS, the challenges faced by manufacturers of vehicle-installed receivers were exacerbated when the Commission significantly loosened the adjacent-band OOB rules years after SDARS receivers were developed and deployed. Moreover, for a satellite-delivered service such as SDARS, the high cost and lead-time required to design, build, and launch replacement satellites renders it equally impractical to resolve future interference through changes from the transmission side.

At bottom, Principle #4 ignores the fact that receiver manufacturers do not unilaterally control the interference environment, which may evolve in unforeseen ways that unexpectedly create a potential for OOB or intermodulation interference impossible for incumbents to reasonably anticipate. In addition to the actions of new entrants, the interference environment can be unexpectedly reshaped by the actions of the Commission itself, such as by authorizing new services or changing rules after an incumbent service has been authorized and receivers have been designed and deployed based on reasonable and responsible principles of interference protection and spectrum usage. Any principle requiring receiver designers to guess how the Commission *could* alter its policies years in the future would be unreasonable on face.

III. CONCLUSION

For the reasons set forth above, Sirius XM urges the Commission to eschew the “one-size-fits-all” approach reflected in Principles #4, #5, and #6 of the Public Notice. In lieu of such principles, Sirius XM urges the TAC and the Commission to recognize that sound spectrum management policy requires case-by-case evaluation and analysis, respecting the legitimate rights of incumbents and the reasonable expectations of receiver designers and manufacturers in a rapidly changing spectrum environment.

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