

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554**

In the Matter of)
)
Revitalization of the AM Radio Service) **MB Docket No. 13-249**

To: The Commission

**COMMENTS OF THE SOCIETY OF BROADCAST ENGINEERS,
INCORPORATED IN RESPONSE TO FURTHER NOTICE OF
PROPOSED RULEMAKING AND NOTICE OF INQUIRY**

The Society of Broadcast Engineers, Incorporated (“SBE”)¹ respectfully submits its Comments in response to the Commission’s *Further Notice of Proposed Rulemaking*, and to the combined *Notice of Inquiry*, FCC 15-142, 30 FCC Rcd 12145, released October 23, 2015 in the above-captioned proceeding (collectively referred to herein as the “*Further Notice*”).² The *Further Notice of Proposed Rulemaking* proposes to implement “further proposals, suggested by commenters in this proceeding, that [the Commission] believe[s] will further enhance the viability of the AM broadcast service.” The *Notice of Inquiry* “pose[s] questions regarding further utilization of the AM Expanded Band, as proposed by certain commenters.” The *Further Notice* therefore follows up on the *First Report and Order* in this proceeding, which adopted several proposals intended to assist AM broadcasters to better serve the public, thereby advancing the Commission’s fundamental goals of localism, competition, and diversity in

¹ SBE is the national association of broadcast engineers and technical communications professionals, with more than 5,000 members.

² The *Further Notice* is a component of the *First Report and Order, Further Notice of Proposed Rule Making, and Notice of Inquiry* in this proceeding, which was published in the Federal Register January 19, 2016. See, 81 Fed. Reg. 2818 *et seq.* These comments are timely filed

broadcast media. SBE offers these comments in an effort to focus the Commission's attention not on what is proposed or inquired about in the rulemaking or inquiry portions of the *Further Notice*, but rather to raise once again an urgent subject that the Commission did not address in the *First Report and Order* in this proceeding and apparently does not intend to consider in the remainder of this proceeding: that of ambient noise in the AM Broadcast band specifically, and in the Medium Frequency (MF) bands generally. It is SBE's sincere belief that the Commission has made and is currently examining some additional short-term improvements in AM broadcasting in this proceeding. However necessary these short-term initiatives are, they are not going to lead to any meaningful, long-term improvement in MF AM broadcasting. To do that, the Commission is going to have to be willing to implement some difficult regulatory reforms that it has not heretofore addressed, and to commit to a regulatory plan which, over time, will reduce the levels of man-made noise in the MF bands, and more broadly in the bands below 30 megahertz. For its comments, SBE states as follows:

1. The *First Report and Order* in this proceeding implemented some opportunities for AM broadcasters, including the ability of *some* AM licensees to acquire FM translators for use with their stations. The elimination of the "ratchet rule" will allow a Class A or B station to make facility changes without offsetting that benefit by having to demonstrate that the improvements will result in an overall reduction in the amount of skywave interference caused to certain other AM stations. Permitting AM stations to use Modulation Dependent Carrier Level ("MDCL") control technologies or algorithms that vary either the carrier power level or both the carrier and sideband power levels as a function of the modulation level will allow AM licensees to reduce power consumption while maintaining audio quality and their licensed station coverage areas. The Commission also modified the daytime community coverage requirement for licensed AM

facilities only, to require that the station's predicted or measured daytime 5 mV/m contour encompass only either 50 percent of the population or 50 percent of the area of the community of license. All of these actions are arguably helpful as short-term fixes for the economic conditions facing AM licensees. However, the Commission did not address a significant request made by SBE in its comments filed January 21, 2014 in response to the *Notice of Proposed Rule Making*³ in this proceeding: commencement of an initiative to reduce ambient AM broadcast band noise, by means of Part 15 and Part 18 rule changes and stepped-up enforcement efforts relative to existing rules. The goal is a significant reduction in AM broadcast band spectrum pollution, especially along public rights-of-way and in residential areas, where AM broadcast reception is most urgent. SBE's premise was that there is an ever-worsening noise floor in the AM band in particular and in the MF range in general. It is a big part of what drives listeners away from the band.

2. SBE's comments in response to the *Notice of Proposed Rule Making* had stated in part as follows:

At paragraph 5 of the Notice, the Commission states candidly - and SBE suggests absolutely accurately - that 'AM radio is particularly susceptible to interference from electronic devices of all types, including such ubiquitous items as TV sets, vehicle engines, fluorescent lighting, computers, and power lines. The noise on the AM band that is caused by those sources is only expected to increase as electronic devices continue to proliferate.' SBE suggests that this enunciation of the current and predicted future RF environment in the medium-frequency spectrum is overly fatalistic, however. It is SBE's view that the goal of AM revitalization will never be realized in the medium and long term in the face of the headwind of a worsening RF noise environment in the AM broadcast band. Some regulatory relief is absolutely necessary.

It is true that the Commission did not propose any regulatory reform with respect to ambient RF noise in the *Notice of Proposed Rule Making*, and therefore it should not have been expected that

³ *Revitalization of the AM Radio Service*, Notice of Proposed Rule Making, 28 FCC Rcd 15221 (2013).

the Commission would adopt any regulatory changes to address this complex issue. However, it was SBE's hope that in the *Further Notice* there would be a proposal to manage MF noise levels; to develop a plan to cause those levels to plateau, and then to decrease, over time. Nothing, however, was proposed in either the *Further Notice of Proposed Rule Making* portion of the October 21, 2015 document or in the *Notice of Inquiry* part, to address RF noise. SBE is of the view that this is a critical omission and that, in any comprehensive, serious plan to improve AM broadcasting, reduction in ambient RF noise over time is a necessary component.

3. Having acknowledged in the *Notice of Proposed Rule Making* that the high noise levels in the AM band are expected to increase further with the increases in the number of electronic products (and due to aging infrastructure such as, for example, power lines), it is discouraging that in this proceeding, from the outset to the present time, the Commission seems content to allow the ambient noise levels in the AM broadcast band (and in the remainder of the MF and HF spectrum as well) to continue to increase and to accept the deteriorating RF environment as a "given." There were very few passing references to this issue in the October 21, 2015 *Report and Order*. One reference was relative to the proposal to change nighttime and critical hours protection to Class A AM stations. The argument from commenters was that they could provide better service, with more power to "*overcome the local noise floor*," if the protection requirements for Class A stations were relaxed. There was no discussion of the possibility of reducing the noise floor. In the same discussion, the Commission stated that: "In this proceeding, spectrum scarcity is not the problem as much as is the need for existing AM stations to overcome *an increasing noise floor* that inhibits local service, both day and night." It is unclear why the discussion was limited to power increases and reduction of protection criteria, rather than the commencement of a discussion about reduction of the noise floor. With respect

to nighttime RSS Calculation methodology, the Commission said that some commenters urged a return to the 50 percent exclusion method used prior to 1991, which considered only the skywave contributions to RSS calculations of co-channel stations, on the theory that it would enable AM broadcasters to improve their facilities and signals and thus *overcome the “increasing noise floor.”*

4. It is well understood that the Commission has over the past several decades strongly supported unlicensed, low-power RF devices and systems. Unlicensed, low-power technologies are efficient from a regulatory perspective because (1) they do not require licensing and (2) due to either low power or very intermittent duty cycles, those devices that comply with the Commission’s rules are individually not significant contributors to the MF noise environment. However, the Commission apparently does not have a clear understanding of the aggregate effects of Part 15 and Part 18 unlicensed devices. Nor does it have any practical ability to address the interference potential of unlicensed devices past the point of sale. The Commission’s ability to conduct post-point-of-sale interference remediation is virtually non-existent⁴ and its recent, draconian reductions in field staff available to conduct spectrum enforcement have made it clear that there is no chance that enforcement in interference cases involving unlicensed devices is not going to be available in the future either. Therefore, the only source of regulatory reform that has a meaningful chance to positively affect the noise floor over time are the regulations that create obligations on manufacturers and importers and dealers, prior to the point that the consumer or user of the device or system comes into possession of it and before it is deployed.

⁴ As but one example, power line interference complaints languish in the Commission’s Enforcement Bureau for more than a decade at a time with no enforcement action taken at all. Utilities are typically non-responsive to complaints of interference to Commission licensees in the HF and MF bands, and the Commission has shown no propensity to issue any meaningful sanctions against chronic Part 15 rule violators, including power utilities.

5. How bad are noise levels in the AM broadcast band now? Very. According to LBA Group, a consulting engineering firm, ⁵AM reception is highly dependent on the desired signal being typically some 26 dB above the ambient noise level. The AM band, LBA reports, is subject to AM coverage distortion, increasing noise threats, and interference from the proliferation of wireless systems, electronic devices and low frequency radiators that distort AM signals more now than as recently as 10 years ago. The electric power grid has expanded, bringing its own noise contributions from corona, arcing, and other modes.⁶ And, urban areas with increasing industrial activities have further added RF noise to the environment. As a consequence, AM stations have increased power to raise their signal-to-noise ratio in an attempt to preserve their coverage areas, often interfering with other stations. However, there is a limit to power increases, both economically and technically, and those limits are now reached in many cases.⁷

6. The severity of AM reception interference is variable, LBA notes, depending on factors including location, frequency, weather conditions, and other factors. Power line interference may actually decrease in wet weather, or change with varying electric load conditions. Much unintentional interference is local in nature, but the cumulative impact can be extensive. In the case of power line interference, the impact is extreme on automobile radios, whose travel path often parallels electric distribution and transmission lines. In one power line field investigation by LBA, the signal of a 50,000 watt radio station was found to be unusable

⁵ See, LBA Group, Saving The AM Band – Why RF Noise Abatement Is So Important (2014), <https://www.lbagroup.com/blog/saving-the-am-band-from-rf-noise/> (Last viewed March 16, 2016).

⁶ A good primer on this subject is found at <http://www.arrl.org/power-line-noise#top> which was prepared by the laboratory staff at ARRL, the national association for Amateur Radio. (Last viewed March 16, 2016).

⁷ See also Gorka Prieto, Manuel Velez, Amaia Arrinda, Unai Gil, David Guerra and David de la Vega, *External Noise Measurements in the Medium Wave Band*, University of the Basque Country – UPV/EHU (2007).

only four miles from the transmitter on a car radio. The signal to noise ratio was measured to be 16 dB, which was 10 dB less than that specified by the Commission for good AM reception. By present Commission standards, the AM station at issue should have a “clean” signal out to almost 100 miles. LBA notes that in the 50 years it has provided AM technical consulting services to US and international broadcast stations, it has witnessed the deterioration in the AM noise environment first hand. The interference limiting impact on a typical AM station coverage was illustrated by LBA in an example. A hypothetical 10,000 watt AM station at 1000 kHz projects a usable signal to 75 miles under noise assumptions of 50 years ago. Many consider that noise levels have risen at least 10 dB, and often much more, in populated areas. That noise increase would shrink coverage to 45 miles: a coverage area decrease of 64%. To overcome this, a power increase of 10 times, to 100,000 watts, would be needed. Even if such an increase were permissible, this would represent a major increase in investment and operating costs, an increase in the station’s interference impact to other coverage areas, and an increase in the station’s carbon footprint.

7. The Commission does not now have, and has never had a complete understanding of ambient RF noise levels and trends thereof *over time*. Furthermore, the Commission has uneven regulations and policies governing noise-generating intentional, incidental and unintentional radiators; and its enforcement efforts in this context have been and are both impractical and insufficient. The combination of these factors paints a dismal picture for the future of the AM broadcast band; for the survivability of AM stations in the longer term (no matter what short-term fixes are implemented); and for the AM listening public. SBE is of the view, as it has stated numerous times, that AM listeners have media options. *RF noise will make them exercise those options*. They are not like some other interference victims such as licensees in certain services,

who will complain actively when, for example, a power line; an RF lighting device, or a Part 15 intentional radiator causes interference to their receivers.⁸ When AM listeners receive interference, they *will not suffer it*. They will simply utilize different media. The Commission's interference resolution procedures are premised on complaints. In making decisions with respect to RF emitters in the medium frequency and high frequency bands, the Commission relies far too heavily on the unenforced and largely unenforceable non-interference requirement generally applicable to Part 15 unlicensed devices. It is incontrovertible that AM broadcast band interference is not well-documented. Even if AM interference complaints were to be lodged from frustrated listeners, the Commission's Enforcement Bureau has not ever been equipped to deal with them, and it certainly is not now that many of the field offices have been closed and experienced staff relieved of their long-held positions. Adequate staff does not exist, and attrition through restructuring of the field offices has left the Commission's Enforcement Bureau severely understaffed.

8. Nor is interference from Part 15 devices to AM receivers addressed at the manufacturer level. It is the *user* of an RF device that is required to adhere to the non-interference requirement in the Part 15 rules. That is a regulatory paradigm that has failed in terms of keeping the aggregate level of man-made interference at manageable levels in the AM broadcast band. Part 15 device users are almost inevitably non-technical persons with no

⁸ AM listeners are in mobile environments, and power lines which frequently radiate RF noise are located along miles of roadways. Radiated RF energy from power lines is at very high levels in many areas for miles along power lines, making AM reception difficult or impossible. Complaints to both electric utilities and to the Commission's Enforcement Bureau about power line interference to HF and MF radio users have gone unaddressed *for more than a decade in numerous instances*. AM listeners are also located in residential environments. RF devices that are intended for industrial environments only are routinely sold to consumers who deploy them in residential areas. As but one example, RF lighting ballasts that are intended for commercial and industrial environments are available for purchase from Home Depot, Lowe's and WalMart have been recently measured for conducted emissions. The quasi-peak limit for this type of device is 48 dB(μ V). The measured conducted emissions from certain of these devices at 6 MHz have been measured at 106 dB(μ V). Wide bandwidth, conducted emissions at those excessive levels will preclude AM broadcast reception over entire residential subdivisions.

interference resolution capabilities and no incentive to assist in resolving the problems, even if any might happen to be reported to them by an AM listener. Add to that the inherent difficulty in finding the source of RF noise from unlicensed (or licensed) RF devices, and it becomes apparent that RF noise from unlicensed Part 15 devices (and Part 18 Industrial, Scientific and Medical devices) is a large and - in the field - unmanageable problem.

9. AM Revitalization, in SBE's view, is not a deregulatory exercise. Some existing regulations should be better enforced, and some new regulations will be required in order to improve ambient noise conditions in the existing AM band. It is obvious that any interference management plan for the AM band has to be based on rules which limit RF noise before it becomes an issue, not *post hoc*, and those rules have to be enforced. As but a few examples, SBE offers a starting point for a plan to reduce ambient RF noise levels:

A. Radiated emission limits below 30 MHz in FCC Part 15 rules for unintentional emitters (such as, for example, plasma television receivers) should be enacted. There presently are no radiated emission limits below 30 MHz for most unintentional emitters. Only conducted limits exist now. This has become a short-range problem with respect to interference from some emitters, such as cellular telephones (especially in charge mode) and plasma television receivers. Direct radiation from a plasma display can be problematic for AM receivers and difficult to remedy. The Commission should consider establishing limits on the amount of noise that can be *radiated directly* from such devices.

B. Lower limits in Part 15 for LED light bulbs should be enacted which are harmonized with the lower limits for fluorescent bulbs in the current Part 18 rules. Part 18 rules govern fluorescent bulbs. Those Part 18 limits are lower than the Part 15 limits which govern LED bulbs. The Part 15 LED bulbs typically operate at levels 12 dB higher than Part 18 fluorescent bulbs. All of the reasons that caused the Commission to establish reasonably low limits for fluorescent bulbs exist for LED bulbs. There are apparently very few, if any interference reports involving fluorescent bulbs that meet Part 18 consumer limits. There are, however, substantial numbers of complaints of harmful interference to Amateur Radio stations from LED light bulbs on an annual basis. This is a good example of an RF management problem that must be addressed *before* the devices are marketed. There could be dozens, if not hundreds, of RF light bulbs in range of a typical AM broadcast receiver in a typical residential neighborhood. If harmful interference occurs and is reported, there is no practical, *post hoc* solution. Filtering of the bulb is not an

option. They couldn't all be found, even if adequate Commission resources were available to investigate such instances. Even if they were to be found, the user of an RF light bulb that contributed to AM receiver interference would not likely be ordered by the Commission to stop using it.

C. Better external labeling on packaging for Part 18 fluorescent bulbs and ballasts should be ordered. Part 18 rules have separate limits for consumer and commercial fluorescent devices. A number of big-box stores and large hardware and consumer retailers, including some well-known nationwide chains are openly selling commercial fluorescent bulbs and ballasts to residential consumer users. Presently, there is no information on the outside of the packaging for these devices indicating that they are not legal to use in residential environments. These same big box stores are all selling Class A industrial lighting ballasts. There is material in the Office of Engineering and Technology's "Knowledge Database" (KDB) clarifying that such marketing is not legal and that the labeling, or even signage and warning, is not enough. If this policy (it is *not* a specific rule) were to be enforced, the big box store would claim that they can sell commercial environment ballasts because they also sell them to buyers for that market, but the devices are on display and the general public is not informed of the proper environment in which to deploy them.

D. Specific radiated and/or conducted emission limits for incidental emitters such as motors or power lines should be enacted. Under present Commission rules, there are no specific emission limits for incidental emitters such as power lines and non-pulsed motors. There are requirements for manufacturers of incidental emitters to use good engineering practice and a requirement that the operator of an incidental emitter use them in a way that does not cause harmful interference to licensed users of spectrum. Those rules are neither enforced, however, nor practically enforceable. Specific emission limits would set an upper level on the worst of the power-line noise cases and would require manufacturers to pay at least minimal attention to design and utilities to evaluate their entire systems at least sporadically, assuming that they perceive that there is a risk of actual Commission enforcement. Although conducted-emission limits could be established for motors and similar 120- or 240-volt devices, only radiated limits would be practical for medium-voltage or high-voltage power lines.

E. Conducted emission limits on pulse-width motor controllers used in appliances should be enacted. Under Part 15 rules, "digital devices" used in appliances are exempt from specific emission limits. There are instances of interference to AM receivers from pulse-width motor controllers in washing machines, air conditioners and pool pumps. If pulse-width motor controllers are digital devices, then these 500- to 1500-watt digital devices would be exempt. Most digital devices that are used in appliances are very low power display units, microprocessor control circuitry and similar devices which have a much lower interference potential than 1500-watt motor controllers.

F. The Commission should substantially increase, and increase the visibility of, enforcement in power line interference cases. There are literally dozens of complaints from Amateur Radio operators of severe interference from power line noise annually. Power line radiation in the HF and MF Amateur allocations will in most cases directly translate to preclusive noise in the AM broadcast band. The Commission has relied completely on the good faith efforts of electric utilities to resolve these. In a few cases, those efforts have been successful. However, far more often, utilities do not have available to them and are not willing to retain persons skilled in RF interference resolution. They are unwilling to act, and the cases brought to the Commission (usually by Amateur Radio operators, rather than by non-technical AM listeners) are allowed to languish unresolved for years, and in some cases more than a decade, without any enforcement action at all. As discussed above, AM radio interference inevitably goes unreported by listeners. A few visible enforcement actions by the Commission would create some incentive on the part of electric utilities industry and perhaps lead to the development of effective industry programs to address the burgeoning power line interference problem. Deterrence works in regulatory enforcement but the Commission's actions have to be both timely and visible in order to create that effect.

Improvement in the noise environment in the AM broadcast band will, over time, contribute substantially to the revitalization of AM broadcasting. The Commission should commence this longer term initiative without delay. It should also task its Technology Advisory Committee (TAC) with studying current ambient noise in the MF band, with an eye toward updating the older data underlying ITU-R P-372-8. If this is done, it will contribute to a reasoned analysis of the Commission's Part 15 and Part 18 rules and thus contribute to a controlled RF environment over time. There is no choice but to do this, unless the Commission is prepared to move AM station licensees to a new band above 30 MHz (an option that will take many more years than AM broadcasters have available. It is suggested that AM broadcasting will never get better in the worsening RF noise environment in the bands below 30 MHz. Some regulatory relief is overdue.

10. Though outside the scope of this proceeding, it is notable and relevant that high levels of ambient RF noise are not a problem restricted to the AM Broadcast band. It is also a problem for FM and television viewers. Steve Johnston, the Director of Engineering and Operations at

Wisconsin Public Radio, has studied ambient noise in detail and presented a paper on the impact of ambient noise on FM reception at an NAB broadcast convention years ago.⁹ The paper noted that the nature of FM analog and TV digital reception experience tends to hide the noise, making it more difficult to attribute interference to man-made (typically Part 15 and Part 18 device) sources. However, the higher noise floor has made the range of FM stations effectively shrink. As an example, the paper cites the experience of a listener to a Wisconsin FM station (in a reception area of quite strong desired signal strength) who reported that after many years of solid reception, she could no longer receive the station in her kitchen. When asked if she had any new electronics or appliances, she said she'd added a new microwave oven. An on/off test with the oven resulted in suddenly clear reception, all back to normal, with the oven unplugged. She acquired a replacement oven of the same make and model, and experienced the same problem. When exchanged for a product from a different manufacturer, the problem disappeared. Another case involved an FM listener who placed his cellphone and charger on his bedside table and could no longer hear one of the local FM stations. Moving the charger of the cellphone across the room, away from the bedside radio caused reception to return to normal.

11. The theory of the paper is that growing levels of indoor noise from modern electronics may be masking weaker FM signals – and probably digital HD Radio and HDTV as well. The ambient noise increase creates the impression that HD Radio and HDTV have difficulty with "building penetration" and that misperception contributes to an otherwise unnecessary effort to increase digital power. The paper reports a variety of measurements with a portable spectrum analyzer and antenna in several urban apartments, suburban houses, and urban offices. All were found to have higher noise levels inside than outdoors on the same property.

⁹.See, Johnston, Steve, *Indoor Noise Conditions in the FM Broadcast Band*. <http://www.wd8das.net/nab-paper.pdf> (last viewed March 16, 2016).

12. The paper cites a trend of long-time FM listeners reporting deteriorating reception over time. In the past five years, the paper cites Audience “Listener Logs” showing a 37% increase in email and telephone complaints related to reception. Doubtless, this is due to a deteriorating ambient RF environment. The strongest noise sources found inside residences were recently-manufactured switch-mode power supplies used for charging batteries in cellphones and digital cameras. Some made a broad “hash” while others produced a series of noise peaks on discrete frequencies through the band, probably related to the switching frequency. Some HDTV receivers and DVD players were also very noisy in the FM band, perhaps due to their power supplies as well. Personal computers and digital clocks and telephones were quite noisy in the FM band also. In urban apartments, ambient noise was found to be much higher than the background level in the parking lots outside. Fewer square feet of space meant the noise sources were more “concentrated” than in single-family residences, which had their own array of noise sources. Within urban office structures, the study found a combination of significant attenuation of the desired FM signals and high noise levels indoors. Specific causes of the noise in this environment were harder to identify, likely because of the number of contributors on various floors and rooms, with reflection and multipath propagation on the noise signals from the metallic structures, all of which tended to “blur” the source.

13. Amateur Radio operators and broadcast engineers are typically able to avoid purchasing Part 15 or Part 18 devices for use in their own homes (though they have no control over their neighbors’ purchases of RF noise contributors) and they are skilled in interference resolution. That level of awareness is not present with all or most non-technical broadcast listeners, however. Concern about this problem tends to be focused on the HF and MF band on

the theory that ambient RF noise increases are principally a problem for AM broadcasters, radio amateurs and other HF and MF band users. However, the cited paper establishes qualitatively that the problem extends to FM and TV broadcast reception as well. It is time for the Commission to address this issue directly, because once the contributing devices are deployed, the noise environment is determined for years thereafter.

Therefore, for the reasons discussed herein, SBE respectfully requests that the Commission proceed without delay to commence a multi-faceted initiative to reduce RF noise in at least the medium-wave band. There are other proposals in this proceeding that will inevitably improve AM broadcasting, but SBE considers the issue addressed herein to be the most urgent of these.

Respectfully submitted,

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