

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

In the Matter of)	
)	
ALL-DIGITAL AM BROADCASTING)	MB Docket No. 19-311
)	
REVITALIZATION OF THE AM RADIO SERVICE)	MB Docket No. 13-249

To: The Commission
Via: ECFS

COMMENTS OF THE
SOCIETY OF BROADCAST ENGINEERS, INCORPORATED

The Society of Broadcast Engineers, Incorporated (SBE), the national association of broadcast engineers and technical communications professionals, by counsel and pursuant to the *Public Notice*,¹ DA 20-23, released January 7, 2020, hereby respectfully submits these comments in response to the *Notice of Proposed Rulemaking*² in the instant proceeding. The *Notice* proposes to establish rules governing all-digital broadcasting by AM radio stations. The Commission seeks comment on whether or not to allow AM broadcasters (at their individual option) to broadcast using an HD Radio all-digital signal [specifically the NRSC-5-D In-band/on-channel Digital Radio Broadcasting Standard (Apr. 2017)] on a full-time basis. These comments are timely filed pursuant to the *Public Notice*. For itself and on behalf of its approximately 5,000 members who are active in broadcast technology, SBE states as follows:

¹ See, *Comment and Reply Comment Dates Set for Digital AM NPRM*, Public Notice, MB Docket Nos. 19-311, 13-249, DA 20-23 (rel. Jan. 7, 2020) (“Public Notice”).

² *All-Digital AM Broadcasting; Revitalization of the AM Radio Service*, MB Docket Nos. 19-311, 13-249, Notice of Proposed Rulemaking, FCC 19-123 (Nov. 25, 2019). See, <https://docs.fcc.gov/public/attachments/FCC-19-123A1.pdf>. (the *Notice*).

1. It is gratifying that the Commission is faithfully continuing the effort commenced in this proceeding almost seven years ago, to enable AM broadcasters to survive economically and to better serve the public, thereby advancing the Commission's fundamental goals of localism, competition, and diversity in broadcast media. SBE favors the instant proposal to permit, but not require, all AM stations to operate in full digital mode. Presently, AM stations have two choices: broadcast using either analog emissions, or with a hybrid analog/digital signal. The *Notice* in this proceeding suggests a third option: broadcasting using an all-digital signal.³ This would not be mandatory, but entirely optional, at the discretion of the individual licensee. This is the proper regulatory step: SBE views, and has viewed the current MA1 (hybrid) mode as a temporary step toward authorizing the full-digital MA3 mode. MA1 was never intended to be the ultimate goal, because it does not offer AM licensees the full benefits of digital broadcasting. This proceeding is refreshing, because it signals to the broadcasting industry that: (1) the Commission views AM revitalization as an ongoing, long-term project with many different regulatory contributors to a return to viability of the AM Service;⁴ and (2) the Commission is now willing to examine directly the exceptionally

³ In 2002, the Commission approved the IBOC digital radio system originally developed by iBiquity, now called HD Radio. The HD Radio system has two AM service modes: hybrid (MA1) and all-digital (MA3). MA1 consists of a combination of analog and digital signals, with the analog signal typically occupying a center band of 5 kHz and digital carriers on either side of and beneath the analog signal. In MA3, there is no modulated analog carrier and the digital carriers are moved toward center frequency with increased power, resulting in what FCC claims is a more robust digital signal that is less susceptible to first, second or third adjacent channel interference. The downside: an analog receiver cannot receive an all-digital MA3 signal, so the disincentive to short-term conversion by AM licensees to all-digital is obvious.

⁴ In the *First Report and Order* in this proceeding, [Revitalization of the AM Radio Service, *First Report and Order, Further Notice of Proposed Rule Making, and Notice of Inquiry*, 30 FCC Rcd 12145 (2015)] the Commission implemented some opportunities for AM broadcasters, including the ability of *some* AM licensees to acquire FM translators for use with their stations. It also eliminated the "ratchet rule" so as to 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. The Commission also permitted AM stations to use Modulation Dependent Carrier Level ("MDCL") control technologies or algorithms that vary either the

challenging issue of ambient noise in the AM Broadcast Band that stands to derail any effort at AM Revitalization unrelated to the issue of overcoming ambient, medium-frequency noise levels. SBE initially feared that the addition of FM translators for some AM stations would constitute the apex of the Commission's plan for meaningful AM revitalization. That fear is now, gratefully, largely allayed. However, SBE urges that the Commission, should it take the further deregulatory action taken in this proceeding, not become complacent that it will have addressed sufficiently the issue of ambient noise in the AM Broadcast Band specifically, and in the Medium Frequency (MF) bands generally. That issue is the most urgent problem facing AM broadcasting, and it is determinative of the future of MF AM Broadcasting in the United States.

2. The Commission has on numerous occasions acknowledged the adverse effect on AM broadcast station audiences from man-made radio frequency interference. As the Commission recently stated in a 2007 Docket ⁵ proceeding:

During all hours of operations, increasing electromagnetic interference to AM transmissions emanates from power lines, electronics equipment such as computers and televisions, fluorescent and neon lighting and dimmers used for incandescent lighting, electric motors, traffic signal sensors, RF from cable lines and equipment, and certain kinds of medical equipment. In addition, some commenters have argued that the introduction of in-band, on-channel ("IBOC") digital radio broadcast transmissions will create a new factor of interference to AM listeners, particularly to those tuned to low power AM stations that operate on channels adjacent to those of 50 kW stations which have initiated IBOC operations.⁶

carrier power level or both the carrier and sideband power levels as a function of the modulation level. This has allowed 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 have been helpful and have contributed to alleviation of the economic conditions facing AM licensees. Together, these actions have been most helpful, and contribute to a solution. But none, individually or in the aggregate, is sufficient (so far) in order to declare victory.

⁵ See, MB Docket No. 07-172, *Notice of Proposed Rule Making*, Amendment of Service and Eligibility Rules for FM Broadcast Translators, FCC 07-144, released August 15, 2007.

⁶ With respect to the reference in the above quote to IBOC interference to analog AM operations, SBE is aware of concerns, beginning in or about 2008 that digital operation by geographically proximate, high-powered AM IBOC broadcast stations caused serious interference to lower-powered, analog AM stations

The Commission's rules governing radio-frequency noise emissions from unlicensed devices such as those cited in the above quote are largely unenforceable, given the volume of emitters and the difficulty in locating an individual interference source. The Commission does not have the resources to address RF interference caused by unlicensed devices deployed after the point of sale. Unless RF noise generators are appropriately regulated *ex ante*, before the point of sale, there is no effective way to retain control of the RF environment and to limit perceived, substantial increases in ambient noise after the emitters are deployed ubiquitously.

3. The instant proceeding looks for the first time at a potential solution to high ambient noise levels in the medium-frequency (MF) band. This is a positive step, since it acknowledges that high ambient noise levels now are a significant source of AM broadcast reception interference and that a solution is a part of any effort to revitalize the AM Service. SBE would suggest, however, that (1) high ambient noise levels at MF are not a "given;" (2) that improvement in regulation of the RF environment in the AM Broadcast Band is possible and urgent; and (3) that, while it is reasonable to implement technological methods to allow AM stations to respond to the presently very high ambient noise levels in the MF bands, the Commission should retain a focus on a longer-term plan to reduce ambient RF noise in those bands. All-digital is a method of

on the same channel or adjacent channels. In March of 2007, the Commission adopted a *Second Report and Order* in MM Docket No. 99-325, which adopted rules to allow radio broadcasters to provide digital radio transmissions to listeners on their licensed channels. An argument heard often in 2008 was that the unintended adverse consequence of this new technology was interference to low-power AM stations. The issue does not seem to be as current concern. However, SBE urges the Commission to determine through further studies the aggregate effect, if any, of increased digital operation and the effect on those AM stations which cannot bear the cost or who must for economic reasons await further conversion of AM receivers to enable digital emission reception, and which must and will continue to broadcast in analog mode for the near future. This is not a matter that can be evaluated based on complaints received by the Commission. AM listeners do not complain of interference. They simply utilize other media.

responding to the problem, and it is a quite reasonable method of treating the symptoms, but it does not combat the disease, which is worsening all the time.

4. SBE concurs with the Commission's view that all-digital AM broadcasting can offer improved reliability and enhanced audio quality over analog emissions, and that it avoids or minimizes some of the issues inherent in analog emission mode. AM stations using an all-digital signal can transmit ancillary information, placing them on a par in terms of flexibility with FM digital and satellite DAB service. It makes music formats possible, and reportedly, all-digital is robust enough to approximate the signal coverage areas of analog AM stations.⁷ Transition to all-digital service would be up to individual broadcaster's discretion, based on the licensee's own needs and the interest and the ability of the market in which the station is located to receive digital AM service. This flexibility is *critical* because of the unavoidable delays in audience acquisition of digital receivers, and because of the cost of conversion from analog or hybrid mode to all-digital. SBE also agrees that a single technical standard should be mandated, because to let the marketplace make the determination of a necessarily uniform broadcast technical standard of this nature has proven unworkable in the past in similar contexts, and it would be self-defeating now. The Commission's decision in 1980 (made at the urging of developers of equipment using incompatible standards) to let the marketplace decide an AM stereo standard delayed the implementation of AM stereo for at least fifteen years thereafter, and placed the AM Service in a competitively inferior position to FM. An

⁷ This is a key issue. According to a study by LBA Group, analog AM reception is highly dependent on the desired signal being typically some 26 dB above the ambient noise level. 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 February 27, 2020). This subject is discussed further *infra*.

appropriate, single technical standard for all-digital AM stations is the NRSC-5-D Standard.

5. SBE is impressed with the results of the NAB Labs All-Digital AM Test Project, and with the analysis of the results of the experiments conducted at WWFD. This experience would indicate that all-digital AM broadcasting will improve audio quality in a difficult RF environment. It is obvious that the auxiliary data capability enabled by all-digital should attract some listeners to AM, and as well it should permit far more flexibility in programming choices (such as music) formats. Some of the drawbacks, however, are equally manifest. The interference potential of higher powered all-digital stations to lower-powered analog AM stations is not firmly determined. Because of this, SBE urges that the prior notification requirement of ten days⁸ proposed in the *Notice* for stations converting to all-digital should be considerably longer, on the order of 60 days, in order to permit local co-channel and adjacent channel analog stations to determine certain baseline data before the notifying station begins all-digital operation. Finally, the *Notice* asks for comment on the costs of conversion for AM licensees and the readiness of the public to transition to all-digital reception. This last consideration seems to SBE to be a significant obstacle to broad geographic rollout of all-digital AM broadcasting. The cost of conversion from analog to full-time, all-digital broadcasting is a two-faceted question. In terms of initial cost, assuming that extensive antenna changes are not required, licensing and signal generation equipment seem to be the major investments. That cost may be well in excess of \$25,000. If infrastructure changes are necessary, the cost could be much higher. This is an expensive proposition for an individual licensee

⁸ It is understood that the 10-day advance notification period was derived from that which is applicable to stations planning to commence hybrid operations.

with one or two AM stations, which are already struggling to compete with other media in the same local marketplace which do not have the technical problems that AM broadcasters have. The other part of the question, though, is the audience loss that will be occasioned by a licensee's decision to convert, and what percentage of current listeners will be lost by the digital conversion in a given case, by virtue of the fact that listeners own only analog receivers.⁹ Looking at the situation broadly, there is likely not sufficient HD Radio receiver market penetration to sustain an all-digital conversion in many locations.

6. The Commission is candid and correct in its assessment that the AM Broadcast Service has struggled for decades with a decline in listenership caused by interference from point-source emitters and aggregate emitters, resulting in a completely unacceptable, high noise floor in almost all environments. SBE would suggest that the current competitive disadvantage of AM stations is almost exclusively related to this factor. There are also other reception issues and a plethora of higher fidelity alternatives that consumers are quick to select. Due to propagation characteristics and interference concerns, some AM stations are unable to provide programming at night that local communities need and want, such as high school sports, and that competitive handicap relative to other media is overwhelming. As SBE has argued for years, AM stations suffer competitively due to rampant (and, inevitably, increasing) electromagnetic

⁹ SBE would direct the Commission's attention to an excellent article on this subject by Alexander, Cris, entitled *Is the Time Right for All-Digital AM?* which appeared in *Radio World Engineering Extra*, February 12, 2020. Alexander notes that, based on HD Radio penetration data, a conversion to all-digital will result in a loss of 50% of a stand-alone AM station's listeners. Alexander opines, reasonably, that the real extent of HD Radio penetration varies widely by region, demographics, local and regional economic factors, and the like. This supports on the one hand a flexible approach as the Commission proposes in this proceeding. However, on the other hand, it would indicate that AM stations in the most difficult, rural, or economically depressed areas will benefit the least from all-digital conversion, and that the economic lack of competitiveness of those AM stations will continue unabated.

emissions from various sources such as power lines, fluorescent and LED light bulbs, computer monitors, and innumerable, mostly unlicensed, RF products. The quality of AM signals in this RF environment results in AM radio being largely dominated by low-fidelity voice formats such as talk radio/foreign language programming), sports, religious programming, and news. It simply is not competitive with other media at present.

7. SBE would reiterate its request made in comments filed January 21, 2014 in response to the *Notice of Proposed Rule Making*¹⁰ in Docket 13-249: 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 would be 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 needed. 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, and all-digital AM is not a solution to the increasing noise floor.

8. SBE's comments in response to the *Notice of Proposed Rule Making* in Docket 13-249 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

¹⁰ *Revitalization of the AM Radio Service*, Notice of Proposed Rule Making, 28 FCC Rcd 15221 (2013).

noise environment in the AM broadcast band. Some regulatory relief is absolutely necessary.

It remains SBE's hope that the Commission will entertain a proposal to manage RF noise levels in the MF bands; to develop a plan to cause those levels to plateau, and then to decrease, over time. SBE is of the view that a critical component of any comprehensive, deliberate plan to improve AM broadcasting includes a reduction in ambient RF noise over time.

9. Having acknowledged 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 passing references to this issue in the October 21, 2015 *Report and Order* in Docket 13-249. 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.”* The instant proceeding is an attempt to create an all-digital work-around for the increasing noise floor. As a means of helping some AM broadcasters (but certainly not all, at least in the short term) overcome the noise, all-digital will certainly be helpful. But as stated above, it is a remedy that treats the symptoms, not the disease.

10. 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, highly directional antennas, ultra wide bandwidths and low power spectral density, 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-existent¹¹ and its recent reductions in field staff available to conduct spectrum enforcement in specific cases have made it

¹¹ 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.

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.

11. How bad are noise levels in the AM Band now? Very. The electric power grid has expanded, bringing its own noise contributions from corona, arcing, and other modes.¹² 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.¹³ The severity of AM reception interference is variable, 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, the signal of a 50,000 watt radio station was found to be unusable only four

¹² 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 February 27, 2020).

¹³ 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).

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. The impact of ambient noise on typical AM station coverage is illustrated 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. Even assuming complete success of all-digital emissions, the continuing increase of ambient noise levels will ultimately reduce the coverage areas of those AM stations.

12. 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 shorter-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.¹⁴ 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.

13. 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 Band. Part 15 device users are almost inevitably non-technical persons with no

¹⁴ 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.

14. AM Revitalization, in SBE's view, is not entirely 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. 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.

15. It is SBE's sincere belief that the Commission has made short-term improvements in AM broadcasting in this proceeding, and the ability of AM licensees to

utilize all-digital emissions is a helpful next step in the process. However necessary these 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.

Therefore, the foregoing considered, the Society of Broadcast Engineers, Incorporated hereby respectfully requests that the Commission proceed to establish rules governing all-digital broadcasting by AM radio stations; to allow AM broadcasters (at their individual option) to broadcast using an HD Radio all-digital signal [specifically the NRSC-5-D In-band/on-channel Digital Radio Broadcasting Standard (Apr. 2017)] on a full-time basis; and to commence a proceeding to develop a longer-term plan to reduce ambient RF noise in the AM Broadcast Band band, and in the Medium Frequency bands generally.

Respectfully submitted,

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