

Before the
Federal Communications Commission

In the Matter of)
Revitalization of the)
AM Radio Service)

MB Docket No. 13-249

Comment from the Broadcast Warning Working Group (BWWG)

I. WHO WE ARE

The Broadcast Warning Working Group (BWWG) consists of hands-on Emergency Alert System (EAS) subject experts from the fields of broadcast association management, broadcast radio and television engineering management and support, radio and television news, industry technical publication, and state EAS Committee leadership.¹ The BWWG hosts the EAS Forum at [<http://eas.radiolists.net/>].

II. THE IMPORTANCE OF THE EAS IN SUPPORTING FEDERAL GOVERNMENT CONTINUITY

The EAS owes its heritage to the Emergency Broadcast System (EBS). EBS originally addressed a major Federal government continuity concern about the propagation of warning messages from the President of the United States in times of national disasters when normal communications methods are not available.² The core Federal government continuity component of the EAS was enhanced when EAS was launched in 1997 when certain AM radio stations became part of what is called the Primary Entry Point (PEP) system³. Disruptions in the communications infrastructure documented in after action reports for Hurricanes Katrina and Sandy show what can happen even at the local level when normal communications methods are crippled and emergency officials need a reliable and available way to communicate with the public.

III. ROOTS: DEPARTMENT OF COMMERCE, THE FEDERAL RADIO COMMISSION AND THE FCC

We offer some perspective here in our Comments that we hope can bring the Commission back to its regulatory roots. The Federal Communications Commission replaced the Federal Radio Commission (FRC) in 1928. The FRC traces its history to the U.S. Department of Commerce. Herbert Hoover, then Commerce Secretary, wanted to bring order to the “chaos” created by unregulated use of the radio waves – too many stations broadcasting on too few frequencies.⁴ This led to the Communications Act of 1927, which was written to control interference between competing RF spectrum radiators including emergency communications. **Business interests that have contributed to working against this mission should be made to comply in full with more clearly defined requirements for the entire spectrum in 47 CFR Part 15.** By doing this the Commission can return one of its original core missions (limiting interference to licensed entities) to its rightful and proper place in the regulatory spectrum.

¹ For detailed information on the BWWG’s core members, please see [<http://eas.radiolists.net/about.html>]

² The New York State Broadcasters Association documented the value of all broadcasting, including AM radio, in testimony given at the FCC’s Superstorm Sandy hearing. Hurricane Sandy disabled New York’s power, cable TV, and internet infrastructures. Basic broadcasting, including key AM all news stations, informed a public unable to receive information using new but storm-vulnerable technologies [<http://www.nysbroadcasters.org/2013/02/new-york-broadcasters-testify-at-fccs-superstorm-sandy-hearing/>].

³ <http://www.fema.gov/primary-entry-point-stations>

⁴ http://www.princeton.edu/~achaney/tmve/wiki100k/docs/Federal_Radio_Commission.html

IV. THE LAWS OF PHYSICS ARE ALWAYS ENFORCED

We respectfully remind the Commission of two points dictated by the so-far immutable laws of physics:

- Any of the proposed AM (Amplitude Modulation) revitalization measures that involve transmitter power increases (even very dramatic increases) will eventually be negated by the still rising tide of RF noise in the band.
- "Digital" transmission modes will not overcome the rising tide of the AM noise floor even though they may mask it for a time. Masking of power line-radiated noise is only effective until the noise rises to a level where Bit Error Rates (BER) exceed their ability to function and the digital signal vanishes.

V. WE NEED AN AM BAND RESURRECTION, NOT JUST A REVITALIZATION

AM Band Amplitude Modulation analog radio once provided unexcelled broadcast market coverage under the best and worst of conditions.

This daunting project to restore AM broadcasting is much more than revitalization. We should look on this as a mission to resurrect an invaluable national resource. Some AM radio stations still have the dial position and coverage patterns with enormous potential for community service. It extends beyond music, news, sports and partisan talk shows. Radio, especially AM radio stations with close ties to local emergency management sources, can help save lives and property when the still-fragile pieces of our modern communications infrastructure fall prey to weather and worse.

Though AM is often called "low tech" by proponents of broadband and digital technologies, it is important to remember that when we most need information that is critical to our survival, the simplicity and reliability of AM radio are major assets and enhance emergency resources. Consider a community, state, region or nation without utility power for days or weeks due to a natural or man-made disaster. AM radio stations equipped with emergency backup power and with studios at or near their transmitter sites have a distinct advantage over TV or FM: AM technology means they will stay on the air in emergencies and disasters and remain accessible for staff and emergency officials.

By way of contrast, cable TV operations at the neighborhood level depend on utility service, and without it. Thanks to industry de-regulation, we measure the limited power available from battery backup in hours, not days. The magic and speed of broadband make us forget that the neighborhood fiber optic lines will be useless once the batteries in their utility powered terminals fail. The cellular telephone network has different but equally devastating vulnerabilities during extended power outages. The growing number of homes served by wireless broadband will go dark and silent after a few hours without utility power -- literally and figuratively.

After Action Reports from recent major disasters show the family car radio with its dashboard AM radio and/or a solar or magento powered emergency radio receiver is often the only or the major source of emergency public information for those at risk.

VII. INTERFERENCE: AM BAND PUBLIC ENEMY NUMBER ONE

The AM noise floor has sharply increased over time for many reasons. Stations that in past years had listenable signals have seen their audiences gradually "stolen" by all types of electronic noise that are the

result of the Commission not treating the intentional and unintentional radiators of that noise as Part 15 devices and applying strong enforcement⁵ to the offenders.

Our plea to the Commission, although it may be too late: **Please start enforcing Part 15 for the AM band.** The continued allowance of technologies like Broadband Internet over Power Lines (BPL) contributes to the problem. There are better ways to deliver broadband Internet to every home in the continental United States without using BPL. Some commenters believe that the Commission should set a strict emission standard of 5 millivolts per meter, measured at a distance of one meter, from DC through the AM band and well beyond that. We support this as a starting point for discussions on hoped-for Part 15 revisions and enforcement.

We must not forget that our high voltage power grid infrastructure itself generates its own unique but devastating assortment of AM band noises when insulators get dirty and wet, when pole-mounted transformers break down, and when conductor connections and fuses develop corrosion - especially on extremely high voltage lines. Many AM broadcast engineers know that power line interference is on the rise based on empirical evidence gathered during their drive to work every day. Some of us remember when many power companies employed designated engineers to respond directly when we called them to report problems we heard while driving to work. Those days when power companies maintained such resources may be gone forever.⁶

In addition to the noise high-tension power lines generate on the AM band, there is yet another type of interference that they cause: changes in FCC-approved AM coverage patterns.

Many new high-tension power lines have been built near areas where AM directional transmitters are prior tenants. Because these high voltage distribution lines are "unintentional radiators", they do not fall under a clear and enforced regulatory burden to constantly monitor the AM station's signal for destructive interference or impact on the signal. **We recommend that Part 15 be amended to make it crystal-clear that such unintentional radiators, literally long wire antennas which "broadcast" or radiate harmonic noise based on high tension power distribution, are held accountable for the harmful interference - caused to the AM band.**

Research, while always valuable, may not hold all the answers. The total dynamics of today's power line interference are not all clearly understood. Testing and/or modeling in a lab to find all the answers does not appear to be possible. The real-world technical variables that can come into play to cause hard core AM band interference are also, and sadly, almost infinite.

VIII. AM OVERMODULATION AND SPLATTER

As others have and will comment in this proceeding, the truth is that over-modulation of AM transmitter carriers causes a condition known as "splatter."

Splatter creates harmful interference to adjacent channels. Aging transmitters and improperly set audio processing can cause "splatter" up to 20 KHz away on the AM band. The Commission should entertain reduction of negative peak modulation in 47 CFR Part 73 to 96% for AM to mitigate interference, and take steps to enforce that limit. The current wording of Part 73.1570 (b) is ambiguous:

⁵ A key 47 CFR Part 15 requirement clearly states that Part 15 devices must NOT interfere with properly licensed services and accept any interference to them from licensed services as a fact of life.

⁶ The Department of Water and Power in Los Angeles, California had a special powerline interference office with a direct telephone number until 2001. That group of two people in Los Angeles looked on our calls as warnings that they needed to go out to find the source before a major failure.

"Maximum modulation levels must meet the following limitations: (1) AM stations. In no case shall the amplitude modulation of the carrier wave exceed 100% on negative peaks of frequent recurrence, or 125% on positive peaks at any time."

While others may recommend that the number be left at or near the 100% maximum possible negative peak level, a more rational engineering truth is that **we should allow a 4-5% margin for error for settings, power supply issues, and measurement errors**. This will provide a better spectral median strip between broadcasters vying for what most audio experts believe is a race for a mythical audience bent on searching for the loudest signals on the band.

The apparent loudness reduction from peaks approaching 100% to 96% is a fraction of a Decibel, a difference undetectable by most human ears.⁷ There may be differences of opinion about the current 125% positive peak modulation limit in the Rules, but making it virtually impossible for carrier shut-off whenever splatter-causing negative peaks at 100% negative peak modulation occur is a needed AM improvement that can contribute to improved signal quality and revitalization. It is time for the Commission to end the destructive AM modulation race that some broadcasters continue to pursue, despite solid technical data that such a race has no basis in reality.⁸

IX. OTHER UNINTENTIONAL RADIATORS

Damage to the AM band can also come from such ubiquitous sources as computers, switching power supplies, compact fluorescent lights (CFL's), electric blankets and devices like tropical fish tank thermostats. In fact, any device with wires that connect it to a power source or a telephone can act as a radiating antenna.

Part 15 testing done before devices can be legally sold is not effective for many reasons, including end user applications, modifications and electromagnetic component aging. What we are talking about here are broadband spark gap transmitters. We have no answers, only questions about why these sources are still allowed to contribute to the damage being done to the AM band. To be fair, many of these devices are likely compliant to Part 15 even when they malfunction, but because they are located within meters of AM receivers in vehicles, homes, offices and other listening environments, their emissions can cause local interference that can contribute to radio listeners giving up on the AM band.

X. DOES DIGITAL HELP THE AM BAND?

Introduction of digital audio to the AM band (IBOC) has proven to many AM band engineers that "no good deed goes unpunished."

Arguably, certain audio bandwidth standards adopted voluntarily by some broadcasters have reduced analog audio fidelity. Furthermore, compromise advantages designed to foster AM digital broadcasting have indeed hurt the coverage of many adjacent channel stations. While listeners may perceive an apparent enhancement of quality from the digital signal, the realities of in-car AM listening frequently negate that advantage when IBOC car radios apply the "blend" mode whenever a digital signal drops out. Further, digital

⁷ From The Scientist and Engineer's Guide to Digital Signal Processing By Steven W. Smith, Ph.D.: "The difference between the loudest and faintest sounds that humans can hear is about 120 dB, a range of one-million in amplitude. Listeners can detect a *change* in loudness when the signal is altered by about 1 dB (a 12% change in amplitude). In other words, there are only about 120 levels of loudness that can be perceived from the faintest whisper to the loudest thunder. The sensitivity of the ear is amazing; when listening to very weak sounds, the ear drum vibrates less than the diameter of a single molecule!"

⁸ There has for as long as we can remember been controversy over how many "flashes" of 100% negative modulation peaks are allowed on station monitors, or how many "flashes" the FCC will tolerate before issuing a Notice of Apparent Liability (NAL). Fact: Any "flash" or other indication that indicates carrier shut-off will result in splatter. It is now time for this issue to be resolved.

transmission cannot magically solve the noise floor problem. When the noise floor increases beyond a certain level, the integrity of digital transmissions is impaired to the point where the signal suddenly goes away.

We believe it may be time for an honest and rigorous revisiting of IBOC for AM to see if turning it off can help revitalize this troubled band by giving amplitude modulation signals “breathing room.”

XI. ANNUAL AM PERFORMANCE MEASUREMENTS MUST STAY IN THE RULES

The Commission should require stations to certify that reports for tests as described in Section 73.44 of the Commission’s Rules and Regulations have been carried out at least once per calendar year. This could be done within the other reports the Commission requires from broadcasters by adding three simple check boxes and text lines:

- Have calendar year measurements per 73.44 been made?
- Were corrective actions required?
- If corrective actions were called for but not carried out, when will they be completed?

XII. MAKE BETTER USE OF THE EXPANDED BAND (1610-1700)

Directional Array AM (DA) stations literally running in “sardine can” or narrow local AM channel conditions should be given preference in the expanded band, as well as for other options that will allow for power and coverage increases.

Commission Rules should take the excellent advice of many professional engineers who are recommending that directional stations on local AM channels be given preference for upgrades with a “Local DA Only” application window for the expanded band. Non-directional station applications in the expanded band are spectrum inefficient and should only be allowed if no local DA stations apply.

We believe that if Commission Rules are rewritten with this philosophy in mind there will be fewer stations operating on these channels, and the remaining stations will have upgrade options to give them better chances for survival.

XIII. USE OF 530 KILOHERTZ

This frequency at the low end of the AM dial is available now for licensing in this country under international spectrum agreements. **A separate Further Notice of Proposed Rulemaking (FNPRM) should be issued by the Commission forthwith to help it decide if there will be a greater benefit if 530 kHz. is opened up in a strictly controlled manner:**

- For the greatest number of stations and
- If 530 kHz. should be allocated to bring back a finite number of “clearer channel” stations that could bring AM radio coverage (especially for major emergencies) back to areas where such service is now missing.

XIV. FAST TRACK OTHER COMMISSION RULES CHANGES WITH ANOTHER FNPRM

We further recommend that:

- Current daytime only stations must be permitted Pre Sunrise Authority (PSA) at 500 W, and Post Sunset Authority (PSSA) at 500 W at least until 6PM local time.
- The Rules should now be relaxed to reduce protected coverage for Class A stations. Protecting them out to 750 miles deprives many AM stations now running at or near financial failure an opportunity to serve a wider audience and thereby become more profitable to operate.
- The Rules must now allow AM stations to use any antenna/transmitter that will work, with no minimum efficiency, as long as annual NRSC measurements required by 47 CFR Part 73.44 show

compliance, and other license terms and conditions are observed to the letter. That said, the existing rules outlining penalties for stations which intentionally run more than 10% over their licensed power need to be stiffened, and ENFORCED!

- The Rules should give upgrade preference to licensees who not only promise to install and maintain long term emergency power generation and other proactive resilience measures as part of their revitalization upgrades, but who also make a written commitment in their applications to devote their broadcasting resources to local emergency public information when this vital life safety need arises.

XV. THE FCC NEEDS TO ADOPT BASIC (AND LONG OVERDUE) AM RADIO RECEIVER STANDARDS

The best analog AM transmission system will sound dull and flat on most AM receivers being manufactured today. There is at least one technical answer to this developed years ago: synchronous amplitude modulation detection⁹. That same transmission will sound great on a properly designed AM receiver, and be more resistant to AM band manmade noise.

The Commission could bring improvement to the band if it adopts sensible AM receiver standards by **mandating or encouraging use of synchronous AM detection** or other AM detection methods that help stave off the rising tide of man-made electrical noise that is slowly drowning the viability of this medium for authorized licensed use. The Commission regulates standards for receivers in other services. Why not do this as a key component for AM band resurrection?

We suggest another FNPRM, again – and again forthwith. Furthermore, **we believe that manufacturers should not be allowed to market FM-only receivers, including automotive receivers**. This could be accomplished (by Congress, not the FCC) as a key element for “last ditch” life safety emergency communications as part of a long sought all encompassing national public warning strategy.¹⁰ Congress should not leave this issue as a “marketplace” responsibility due to the importance of the AM band as a national emergency resource.

XVI. THE RATCHET RULE SHOULD NOT BE APPLIED IN CERTAIN CASES

The original intent of this rule [Section 73.182(q), footnote 1] had unintended consequences that actually hurt AM band improvements. Some stations making modifications that were subject to it wound up with patterns that, had the rule not been applied, would have benefitted their projects without materially hurting other AM band occupants. **We suggest, for lack of a better term, using a virtual “torque wrench” of common sense on the Ratchet Rule based on engineering realities when it is applied.**

XVII. CURRENT FM TRANSLATOR RULES DO NOT REVITALIZE AM

If FM translators are to be a real part of AM revitalization, Commission Rules must:

- **Tie them to an AM station, and specify that the license be non-transferrable.**
- **allow installation of translators at AM transmitter sites if AM licensees wish to do so.**
- **Make it clear that the translator can only be on the air if the AM is on the air, except for**

nighttime operation for daytime stations.

⁹ Synchronous forms of demodulation have inherent advantages over other forms of demodulation, although the additional levels of complexity mean that they are not always used. Synchronous AM demodulation is generally reserved for higher performance radio receivers, although many integrated circuit technology means that it can be incorporated into a chip with relative ease. Quoted from: [<http://www.radio-electronics.com/info/rf-technology-design/am-reception/synchronous-demodulator-demodulation-detector.php>]

¹⁰ Unfortunately, we can find no cell phones at this writing that have AM receive capability. We believe that while there are technical challenges to overcome, no one has equivocally stated that it cannot be done.

XVIII. PROGNOSIS

If this were a hospital emergency room discussion about the ailing AM band, the doctors (in this case professional broadcast engineers and consultants who work in the real world emergency rooms of AM broadcasting) would triage the patient (the AM band in this case), diagnose the illness, and issue a prognosis.

Unfortunately, in the case of our AM band patient today, all the healing powers and remedies based on the measures outlined in this and other Comments will not effect a total cure. Full recovery will require aftercare by responsible licensees offering quality local programming and Public Service that really matters to the public, and to the overall public safety emergency communications picture.

There is a single optimistic note we can offer. If the Commission does take steps to cure the ailments we have outlined here, responsible licensees will have a resurrected (not merely revitalized) AM band and will be more likely to respond with sparkling sound and continued commitment to the band. This sound and commitment, from transmitter to properly designed receiver, can enhance all programming, especially at critical times when clarity, intelligibility, and reliability can help save more lives during major emergencies.

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* We dedicate these Comments to the memory of BWWG Core Member Larry Estlack who left this world on December 16, 2012