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THE FUTURE OF AM RADIO: SOME STATISTICAL STUDIES
by Randy Stewart

Dr. Arlen Diamond is a professor of Electronic Media Communications at Southwest Missouri State University in Springfield, MO, the Station Manager of the University's NPR station KSMU-FM... and my boss for the past 13 years. During the past year Arlen and another SMSU communications professor, Dr. Jim Sneegas, have conducted experimental studies of *public perceptions* of AM radio vs. FM, the results of which were presented at the NAB convention last spring. I managed to coerce Arlen into sitting down with me to discuss his findings. That discussion follows.

RS: Even though you're an FM station manager, you've had a lifelong interest in the AM BCB...

AD: Well, I grew up listening to AM radio in the '50s and '60s, and like a lot of people in the Midwest, we didn't have any FM stations around to listen to, so *everybody* listened to AM radio. And particularly at night it was nice to be able to listen to all the distant stations coming in, like KOMA-1520 -- I'll never forget that "Kissing Tone"!

[Arlen had a ham license at the time, and did a lot of SWLing and BCB DXing as well.]

RS: Before you started this research project, what did you perceive the major problems of the AM BCB to be? Obviously there are many....

AD: I think those problems boil down to two things: 1) the AM band is awfully crowded and full of mutual interference, especially at night when the ionosphere shifts; and 2) there's a lot of *MAN-MADE* noise on AM which just increases every year. Now, those are areas we can't do too much about personally, but one of the assumptions I made as I began to look at this whole area of research is that maybe people can't really *hear* the difference between a *good* AM signal and an FM signal ... they just *assume* that AM is "bad" because of years of experience dealing with all the interference problems, etc.

RS: Then too, AM receiver manufacturers haven't paid much attention to the problems of the band in recent years... there's certainly justification for people thinking AM is "bad" because they have little or no chance to hear "good" AM!

AD: Right, the typical consumer AM receiver of today--even when part of an expensive component AM/FM tuner--has about \$1.86 worth of circuitry in it! Then we had the whole debacle with AM stereo... I think a lot of industry people felt that stereo would save AM--but stereo didn't bring anything *new* to AM. People were already used to stereo, and so they saw stereo AM as simply a cheap imitation of FM. So the question becomes, "if people were presented with good-sounding audio and told it was originating on an AM station over an AM radio, would they be able to appreciate, and clearly and objectively evaluate, the signal?" With that question in mind, Dr. Sneegas and I set out to take a look at peoples' preconceived notions about the AM broadcast band.

RS: You actually conducted two experimental studies within a six-month period.

AD: Yes, with large sample sizes--several hundred individuals were involved in these listening tests, using students here in the Communications Dept. The first study we did was a lot like the "auditorium testing" that's done by many stations to test their music formats. We had four large groups of students in a lecture class in basic communications, and we played all four of these sections the same piece of music--a segment of a pop song--and each group who heard it was told it was something different. We had that song actually played from a compact disc on an FM station and recorded off-the-air on a cassette tape; we had it actually played on an AM station and recorded off-air; then we had a straight CD-to-cassette dub. So one group heard the AM aircheck; one heard the FM aircheck; the third group heard the CD-to-tape transfer but was *told* it was an FM broadcast; and the fourth group heard the CD-to-tape dub but was told it was an AM broadcast. The rating sheet used by the students contained five rating scales that dealt with hiss; noise & distortion; stereo separation; fidelity; and overall sound quality. It was a seven-point bipolar scale, and all they had to do was make a checkmark along the scale. We also gathered a little information about their radio

listening habits and the importance of good audio, etc. But the scale itself was simply one set of five scale responses; they had ample opportunity to listen for a couple of minutes to this music cut and then to check the points on the scale. What we found was that the CD-to-tape dub that we called "FM" rated highest on our scales of fidelity and other technical measures, but very, very close behind it was the *actual* FM aircheck. And then a ways down on the rating scale was the CD-to-tape dub we called "AM"--even though it was *IDENTICAL* to the one that rated highest! And the real AM aircheck was way at the bottom.

RS: So this initial experiment indicated that no matter what they were *actually* hearing, if you *labeled* it "AM" they automatically thought it was lo-fi.

AD: Right. There was good news in the study, in that the "simulated" AM (again, a direct CD-to-tape transfer) did rate much higher than the actual AM aircheck--they *could* hear the difference--but it was still rated significantly lower than either of the "FM" tapes. What we found was a negative predisposition toward AM radio, or what I term the "psychological barrier" to MW BCB listening: "if it's AM it *can't* be as good as FM."

RS: Then you received a research grant from the NAB to conduct further studies...

AD: We submitted a proposal to the National Assoc. of Broadcasters under their Academic Research Grant program--a competitive program--and we were very pleased to be one of six grants funded out of more than 80 applicants. We then pursued the same idea, trying to determine that if AM were called something different--if we changed the label "AM" to something else--would it therefore get rid of that negative "baggage" that AM radio carries, and allow people to develop a new attitude that would reduce or eliminate this "psychological barrier" that, we hypothesize, exists in regard to AM radio listening.

RS: Your methodology was quite a bit different the second time around.

AD: The second time, instead of using four very large groups, we used twelve smaller groups of approximately 25 people per group, so we still had roughly 300 individuals involved. But we were able to get away from the "auditorium" setting, which allowed us to manipulate several other variables concurrently. Once again, we looked at the effect of *label*--in this case, "AM," "FM," and something we called "Radio 2000," which we described very simply as "a new broadcast technology," just to provide a third (and different) label. Also this time, instead of just one song we had eight different cuts--a couple of Adcon selections (such as Bette Midler), a couple of hard-rock cuts, a couple of country selections, and this time we added *voice* cuts--a news clip and a clip from NPR's *Car Talk*. The voice cuts didn't work well, though. Essentially what we did was make up several versions of each cut and not only look at the effects of the *labels* on the listeners' perceptions, but also we attempted to find out how people perceived "stereo" vs. "mono", and "high fidelity (frequency response out to about 12.5 or 15 kHz) vs. "low fidelity"--which was actually better than most current AM radios can reproduce, but approximating what the new AM standards might produce on a "high fidelity" MW receiver--a frequency response out to about 7.5 or 8 kHz.

RS: Now, this time you did *not* use airchecks; instead, you manipulated the music cuts with a one-third-octave graphic equalizer.

AD: We went from CD to DAT (Digital Audio Tape), and then manipulated the signal through equalizers and an audio console onto a second DAT tape to create four versions of each cut: "high fidelity stereo," "high fidelity mono," "low fidelity (7.5 kHz-bandwidth) stereo" and "low fidelity mono." Each one of those treatments was heard by three different groups of people. However, we also split up the 12 overall groups in such a way that four of the groups thought they were listening to FM radio, four thought they were hearing AM radio, and the other four groups were told they were listening to "Radio 2000." As you can tell, it was a rather complex experimental design, but it allowed us to collapse these "cells" of people around whatever variable we wanted to look at, whether it was stereo vs. mono, hi-fi vs. lo-fi, or the "label effect."

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Frankly, the results were *not* as striking as they were in our first study. We found some *limited* support for the hypothesis that giving "AM" a different name might help it. In virtually every instance, "FM" was rated most positively, "Radio 2000" in the middle, and "AM" was rated lowest. However, we found that real statistical significance came into play only on the "fidelity" scale: people did think that there was a difference between FM and AM in terms of fidelity.

- RS: So even when you played them the high-fidelity DAT tape, in stereo, they still *thought* they were hearing low-fidelity if you labeled it "AM"?
- AD: Yes, they perceived the fidelity to be not as good. Admittedly this is an area that we can't substantiate statistically, but I have a gut feeling that something else has to be done other than simply continuing to call AM "AM" as technical improvements are being made. One step in that direction is that the NAB, in cooperation with the Equipment Manufacturing Association, has come up with a certification mark with a kind of catchy logo, "AMax" [pronounced "A-M-Max"]...
- RS: This is for the new higher performance "super" MW receivers that are being developed?
- AD: Right, a new radio that will be able to adequately process the new NRSC standards, allow you to select wide or narrow bandwidth as reception conditions warrant, etc. So hopefully, the public can be educated... the thing we found among college-age students is that they all place a high premium on "good audio quality." It's just that they need a little help in discovering what good audio quality *is*. Part of that is a learning process in order to discriminate between good audio and poor audio.
- RS: Just how "good" is the audio quality possible on the AM BCB, vis-a-vis FM, or compact discs and other digital sound formats?
- AD: I think if we can get an AM signal with at least a 7.5 kHz bandwidth or so, most people will consider that pretty decent sonically, simply because if you look at the audio spectrum, there's not a lot that happens in the upper frequency ranges. Certainly you have harmonics up there which add a dimension to music reproduction, but when you consider the kind of listening environment most people are in anyway (unless they're using headphones in a quiet environment), there's usually enough background noise to diminish one's ability to hear those subtle overtones and softer dynamic levels.
- RS: Does the AM broadcast band have a future? A lot of people, including DXers, think it's a dying medium.
- AD: I think it does--I've always believed that the BCB has a future. This is just pure conjecture on my part, I have no support for this at all, but there's a lot of talk right now about Digital Audio Broadcasting ... the NAB, in an attempt to get things off the dime and to try to come up with some kind of standard, initially supported the "Eureka 147" digital broadcast system developed in Europe, simply because it's farther along experimentally than other systems. It's a system that may well work, but there are certainly a lot of questions about where to put it in the RF spectrum... it seems to me, rather than developing a whole *new* frequency band for DAB, that *IN-BAND* solutions present a much, much better way to go. And I think those in-band solutions will be developed for both AM and FM--first on FM, certainly, but I think as digital bit-compression technology continues to develop, we'll be able to find a way to pack a fairly wideband digital signal right on an AM carrier with a 10, 9, or even 5 kHz frequency spacing, and in such a manner that it's not subject to the kinds of interference that plague the mediumwave band today. It may be a decade away... but we're at least a decade away from full implementation of something like a "Eureka" system anyway.
- RS: Can the nation's current AM stations survive that long?
- AD: Well, I don't know... of course the "free-market" question is "*should* all of them survive?" We still even today have more AM stations than FM in this country, and certainly there's an AM station available for sale somewhere for anybody who wants to get into any kind of specialized broadcasting, and for not much money: church groups, foreign-language broadcasts, whatever. There's no significant barrier of

entry to get into AM broadcasting right now. I think we can probably afford to clean some stations out; some stations are going to have to go broke. Many are dark right now, and a lot of the remaining ones are losing money. The expanded AM band may decompress a little bit the crowding, as stations begin to move into it--and by the way, the new "AMax" receivers will have to be able to tune the expanded band too. But I really believe that AM can survive... however, I think it will probably be a carrier mostly for *digital* audio sometime within the next decade.