



White Paper:

## **HD Radio: Prospects for a Successful Evolution**

Challenges facing the radio broadcast industry in the age of digital media.

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Author's note, February 2008: In the two years since this paper was originally produced, there has been slow progress toward bringing HD Radio into the mainstream. There have been plenty of distractions, with much attention focused on the cut-over to DTV in February 2009, along with a host of broadband and cable developments. Nonetheless, some of the developments have been significant, and updates are shown in blue in several locations in this paper.

# HD Radio: Prospects for a Successful Evolution

## Executive Summary

For decades, radio has been the most universal and easily accessible medium. Wherever you turn, there is a radio receiver: next to the bed, in the kitchen, in the car and in the office.

There are an estimated 575 million radio receivers in the United States – more than two for every person. About 12,000 radio stations blanket the country with a large variety of formats and styles, often reflecting the needs of the communities they serve.

But the radio broadcasting industry is at a crossroads. According to the Washington Post, the radio industry “is in something of a panic these days over declining audiences and snowballing competition from the two big satellite radio services, XM and Sirius.”<sup>1</sup> Broadcasters, said the Post, “want you to get a digital radio yesterday.”

Studies show overall radio listening has declined about 15% in the last 10 years. The audience for public radio, which has bucked the trend by growing during this period, also has begun to slide for the first time, indicating that competitive media, such as satellite radio and MP3 players, are siphoning off the audience.<sup>2</sup>

Although satellite radio is the most direct and noticeable competitive threat, it is one of several recent alternatives that have splintered the traditional audience for radio. The runner who once had a Sony Walkman tuned to her favorite station now has an iPod. Mobile phones are sprouting new services that include music channels.

In fact, a recent study by Bridge Ratings, a radio research firm, shows that MP3 players are impacting the audience for both terrestrial *and* satellite radio.<sup>3</sup>

The radio broadcasting industry has responded to this challenge by embracing the first technical development since FM Stereo was introduced 40 years ago. HD radio brings the advantages of digital audio technology – extremely high fidelity and greatly improved reception – to a medium that has been defined by its low-tech simplicity.

But will it work? Can the industry recover its audience by going digital? Although HD is a big change in terms of radio technology, it is not clear that listeners will be impressed. In that case, broadcasters will have to rely on something other than technology to compete against new media alternatives.

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<sup>1</sup> Marc Fisher, “For Digital Radio to Compete with Satellite, It Needs to Think Outside the Jukebox,” Washington Post, April 2, 2006

<sup>2</sup> “Audience 2010,” Walrus Research and Audio Graphics, March 9, 2006

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<sup>3</sup> Bridge Ratings Audience Erosion Study, April 7, 2006

### **AM vs. FM vs. HD: The technical basics**

Audio entertainment begins and ends its journey to your ear as an analog form – sound waves through the air. Electronic media attempt to convey and reproduce voice and music as precisely and faithfully as possible. All analog media are limited by their underlying technology, in which electronic wave forms are created that represent and then reproduce the original sound waves as closely as possible. It's an imprecise system.

AM radio, which is easily impacted by electrical interference of all types (auto engines, power lines, electrical storms), also suffers from a limited audio range that covers only part of the human hearing spectrum. The missing high notes and reduced bass response are notable when compared to FM or CDs. Additionally, technologies that make the signal more consistent and listenable have the side-effect of slightly distorting the audio.

FM carries an audio range that nearly matches the human ear. Although it is unaffected by electrical interference, it is prone to “multipath” interference – the “phhh-phhh-phhh” sound caused by the signal as it bounces and echoes off objects and the landscape. The echoed signal reaches the receiver very slightly later than the original, distorting and weakening the FM signal and the audio it carries.

HD radio improves fidelity and reception by converting sound to a digital format - a bitstream – which is a numerical sequence reproduced with precision on the receiving end. With the receiver reading only the bitstream, the radio is able to ignore, or “reject” interference.

HD radio also offers greatly enhanced fidelity and clarity. **Fidelity** is an audio system's ability to reproduce the sound equally well at every frequency. Analog systems typically respond better at certain frequency ranges, dropping off at the low and high ends. (Your graphic equalizer is there to compensate for this).

Enhanced **clarity** (crisp, precise sound) is achieved in HD Radio by more precisely defining and reproducing the original sound waves.

### **New Technology, Same Spot on your Dial**

HD Radio is a specific broadcast technology developed by Ibiquity, which is partly owned by some of the larger radio group owners. Ibiquity licenses the technology to transmitter and receiver manufacturers.

Other parts of the world have selected other standards. Europe uses a standard called DAB, developed by Digital Radio Mondiale. The two standards are not compatible.

HD radio does not require a new radio frequency band, as FM did. The HD Radio signal is added to the existing signal (along both sides of the main frequency), creating a “hybrid” signal of the existing AM or FM channel, plus two new digital channels. This approach, known as “In-Band, On Channel” (IBOC), allows either an analog or digital radio to tune to the station's usual frequency.

If the HD receiver senses a digital signal, it switches over to the main digital channel (usually carrying the same programming as the original channel) within a few second. A second digital channel is an option, and it carries a different program.

### **But will it make a difference?**

HD Radio, according to Ibiqity, delivers CD-like audio and almost flawless radio reception. But the improvement from FM to HD might not be noticeable to casual listeners.

Consider:

- *While FM offered an enormous improvement in sound quality compared to AM, FM already compares favorably with HD. In a noisy environment – in traffic or in a retail store – FM and HD will probably sound the same to many listeners. (See Acoustic Comparison chart, next page).*
- *The audience for internet radio is growing. About 12 percent of Americans tune into an internet radio stream at least once a week.<sup>4</sup> Considering the poor quality of streaming radio over inconsistent broadband connections, many listeners must consider programming a more important factor than sound quality.*
- *Consider how long it took for FM to overcome AM. FM was introduced in the late 1940s. FM Stereo broadcasting was launched in*

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<sup>4</sup> Arbitron/Edison Media Research audience study, April 13, 2006. The study also showed the audience for AM/FM radio has begun to stabilize while other forms are growing, indicating strong demand for radio programming overall.

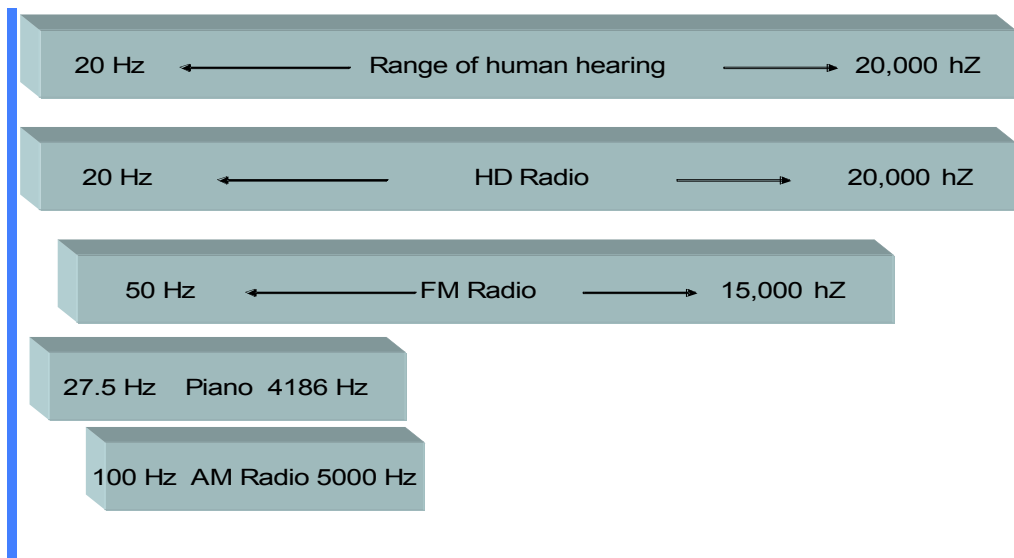
*1962. But despite the great difference in sound quality, FM's audience share finally exceeded AM's in 1979.<sup>5</sup>*

It appears that reception and fidelity are only part of what the audience is looking for. Selection, personalization and convenience are significant audience factors.

*A latecomer to the digital revolution, radio broadcasters cannot rely on technology alone to compete.*

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<sup>5</sup> Linwood A. Hagin, Ph.D, "FM Radio, Superiority Over AM Radio 1975-1986, Youngstown State University, Apr 4 1996



**Acoustic comparison:** The human ear can detect the low rumble of thunder at near 20 Hz as well as the high screech of 20,000 Hz – although many people have little ability to hear sounds above 15,000 Hz.

FM radio nearly matches the hearing range of the average person, with a slight drop-off in fidelity at the lower and upper ends of its spectrum. HD Radio produces sounds more faithfully through the entire hearing range – but for the most part matches the abilities of FM.

The piano's range encompasses the entire range of all other musical instruments. But some instruments have resonances and percussive inflections that might be out of the piano's range.

The human voice ranges from about 87 to 1,175 Hz.

### The Content Problem

For radio to compete, it has to face the *real* reasons for audience desertion, and these are only partly due to technology. The industry must also face the programming alternatives posed by satellite radio and the personalization offered by MP3 players.

So far, radio is revamping the medium while ignoring the message. But since the audience comprehends these as a

package, the industry needs to address both simultaneously.

“HD Radio presumably solves an industry problem, namely how to keep up with technology, expand our offerings to advertisers and compete more effectively with satellite radio. *But what audience problem does it solve*

uniquely?” asks radio industry analyst Mark Ramsey.<sup>6</sup>

*Programming is the first and foremost competitive element.* The iPod user walking or running down a noisy street is not in it for the sound quality – there is too much competing noise (including the runner’s breathing and footsteps). What she does have is choice – the ability to listen to what she wants, when she wants it.

The satellite radio enthusiast, similarly, is not buying sound quality (a negligible improvement over FM), but a wide range of choice and no commercials.

Radio programmers must compete by putting together attractive offerings of creative music and talk.

The industry also has to do something about the clustering of commercials into four-minute blocks several times an hour – common sense alone dictates that this trend negates otherwise good programming and turns off the listener. New and different types of commercial scheduling are desperately needed.

Radio has a long history of creativity. Stations used to compete with each other by vying to connect with their audience, relying on personality and music choice to attract audience. Broadcasters must now again let loose their most creative programmers to succeed in a fragmenting market.

One step broadcasters can take now is to offer several channels of high-quality programming that are available via HD

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<sup>6</sup> Mark Ramsey, “Commentary: The Premature Death of HD Radio,” Sept. 1, 2005

in every major market – an approach that mimics satellite radio’s success.

There are some positive steps in that direction, particularly in public radio where separate program streams have been developed, available only on HD. Commercial radio has yet to show such initiative.

### **The most important market**

HD’s other challenge is the business model. Satellite radio has taken a page from the cell phone revolution, offering inexpensive receivers when you sign up for monthly service.

Satellite radio also has pushed hard to get its receivers installed in new cars. As a result, the new car buyer *inherits* a new radio and is very likely to sign up for service. Car makers and dealers will be the probably be the primary battlefield between HD and satellite. The winner of that battle will probably win the war.

This will be a difficult challenge for broadcasters, who have not been in the business of pushing equipment. The last radio evolution – AM to FM – was market-driven with consumers seeking out their own FM receivers.<sup>7</sup>

The radio industry must now promote not only its programming – as it has done for years – but technology and equipment. It will take a joint effort among broadcasters to accomplish this.

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<sup>7</sup> A local Best Buy, in a recent visit, offered about a dozen Sirius and XM radios for sale for car and home. There were no HD Radios available and the sales staff did not know where to find one. In mid-April, however, Radio Shack announced it will begin carrying some HD receivers.

Only by facing these threats head-on can radio survive these challenges. Innovative, compelling programming, combined with an industry-wide push for HD, are needed.

The new digital technology itself, without these measures, is likely to have little impact.

## Conclusions

- HD Radio offers a noticeable reduction in interference and an incremental improvement in sound quality compared to FM radio. But the difference might not be enough to be meaningful to many listeners.
- A change in listening habits spurred by a change in technology alone is not a viable strategy because it could take many years – and this comes at a time when the audience is rapidly embracing alternative digital media forms.
- Radio broadcasters must compete by offering compelling content and changes in format that make listening more attractive.

- The radio broadcasting industry also must battle satellite radio to place receivers in new cars – a market that could determine the winner. This will take a determined, cooperative promotion of HD radio receivers. *But there is some progress on that front. In January 2008, Ford announced that HD radios will be available as standard equipment in all new cars, beginning with the 2009 model year. Expect other carmakers to follow.*

Radio indeed is at a turning point. With the right moves, broadcasters have the opportunity to effectively deploy new technology, along with changes in programming, to continue to dominate over satellite, webcasting and other new media forms. The next two or three years will be critical.

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