CABLE AUDIO SERVICES --- THE (HI-FI) SKY'S THE LIMIT

Ned Mountain

UA-Columbia Cablevision, Inc

San Angelo, Texas

The time has come to re-examine the potential and impact of audio services within the cable television industry. This paper comments on several marketing and technical aspects of implementing quality service. A unique blend of technology, public demand for diversification, and new program services is rapidly coming together that will allow creative operators to develop an exciting audio product for their subscribers.

INTRODUCTION

Cable television is a dynamic, expanding business with unlimited potential. Much current thinking is directed toward taking the "television" out of the term and looking at the ultimate blue sky potential of the "cable". At this point in the growth of our industry, it is a good idea to examine all potential sources of revenue that our broadband networks will generate in the future. It is being demonstrated daily that the public's thirst for entertainment alternatives in the home is vast and underestimated. It is my contention that the demand applies to audio as well as video.

VIDEO AND AUDIO DEVELOPMENT

For the sake of comparison, let's look separately at the development of two types of electronic home entertainment services; video and audio. Electronic video services started with commercial television in the early 1940's. Obviously, the needs of the public could not be met with just one video channel; thus evolved the networks, independents and public broadcasters. Cable television came along early in the life of broadcast video first as a means to extend the broadcast range to new geographic locations and in recent times, as we all know, to expand the programming varieties to beyond those which could be broadcast in a particular area due to spectrum shortages. An additional source of video entertainment service is rapidly emerging in the form of home video recording and playback equipment. The concensus seems to be that all 3 forms of video sources will continue to exist, compete, and to various extents compliment each other.

The development of aural entertainment service can be looked at in a similar analogy. The same 3 forms of consumption exist; broadcast, cable, and home audio recording/playback, but they evolved in slightly different order. First to be developed was the phonograph in 1877. Next, commercial radio broadcasting began in 1920. These two forms of audio entertainment make up the bulk of today's available sources. Both industries continue to grow, flourish and compliment each other. The third item to be considered is audio services via cable. It is my opinion that the area is being left behind in our industries "blue sky" thinking.

TECHNICAL CONSIDERATIONS

It is possible to add a multi-channel FM audio service in just about any well designed CATV system provided that good engineering practices are used. The spectrum from 88 to 108 MHz is generally available for FM services with the FCC subdividing this 20 MHz of spectrum into 100 channels each of which is 200 Khz wide. Over the air channel assignments are never made on adjacent channels in the same area and the same should be the rule when planning the cable FM spectrum. If a minimum adjacent channel spacing of 400 Khz is used, a maximum of 50 cable FM channel slots will be available. Local FM broadcast signals should be translated to a new frequency preferably 400 Khz removed from the assigned off-air frequency. This is done to avoid multi-path problems and results in a clean feed of local FM stations at predictable levels. A word of caution: Be sure to use only FCC channel assignments for cable FM as many of the new digital tuners will tune only these frequencies. It should be obvious that any serious FM service will require the use of FM head-end processing so that level uniformity and control can be maintained by the cable operator.

Speaking of levels, FM carriers can be run at a much lower level on the system, typically 15db below video carrier. The main reason is that the only portion of the signal that is overly sensitive to high carrier to noise ratio is the stereo sub-carrier. Since this sub-carrier occupies only 30 Khz of spectrum, the system noise present in this slot is at least 20db lower than that present in the 4 MHz video spectrum. The net effect

is that -15db levels will generally produce stereo signal to noise ratios of 50db or greater.

The effect of adding even 50 FM carriers to a system carrying 35 TV channels is insignificant. The net increase in amplifier level would be less than .2db. Since all FM carriers are at least 15 db down from video, resultant distortion products will be insignificant and random. Essentially a well designed CATV distribution will be transparent to the FM signals and video operation will not be affected.

Since FCC rules do not exist for cable FM, it is in the operator's best interests to define his own performance standards. The objective should be to provide the subscribers with stereo signals free of whistles, beats and other noises. For off-air sources, the commercially available heterodyne processors will provide excellent quality. FM signals imported via microwave sub-carriers (be it terrestrial or satellite), however, deserve special attention. A general rule of thumb would be that if the microwave system is single hop or multi-hop with no demod - mod process at intermediate points, than standard heterodyne processing with 75 Khz deviation will probably provide excellent results. If the signal must go through more than one demod - mod process, then methods other than standard heterodyne processing may be required for satisfactory stereo operation free of beats and noise. This is due to inherent nonlinearities in the FM detection which causes a beating of horizontal sync multiples with the 38 Khz stereo sub-carrier frequency. This shows up as distinct annoying audible notes in the stereo audio. The beat frequencies are derived as follows:

3 (15734) - 38000 = 9202 HZ Audible Beat

38000 - 2 (15734) = 6532 HZ Audible Beat

Satellite delivered FM stereo is relatively new and more work remains to be done to maximize quality while minimizing bandwidth. Methods do exist to transmit excellent quality FM stereo via satellite while keeping the hardware cost to the cable operator reasonable. The Leaming system of enhanced multiplex transmission was chosen by United Video for transmitting the signal of WFMT-FM, generally regarded as one of the highest technical quality FM stations in the country. Actual proof of performance data verifies that this method is probably the best available with today's state of the art.(1)

To summarize the technical considerations, do not leave them to chance! Individually process the FM sources and pay close attention to transmission methods for imported sources. Quality must be of paramount importance when considering audio service.

THE (HI-FI) SKY'S THE LIMIT

Nobody needs to tell us about the television programming variety available to today's cable operator. Local off-air, imported off-air (with restrictions), satellite non-broadcast, and local origination sources are combined in a programming "blend" tailored for maximum acceptance by our subscribers.

If the same type of creative thinking were to be channeled toward tailoring an audio service for our subscribers, what would the result be?

The first question I get asked when proposing this concept is "Why Bother?? It isn't worth the effort." Let's take a look at why aural service may well be worth the effort:

1. There are no rules or restrictions with regard to aural service. We are free to develop these services with the sole objective of fulfilling subscribers desires.

2. No technical requirements exist for aural services. While the majority of such services will employ standard FM broadcast and multiplexing techniques, the door is wide open for technical innovation.

3. The radio broadcast industry is healthy! As of April 1980 there were 8748 radio stations on the air in the United States.(2) Radio advertising revenues showed a 12% increase in 1978 over the previous year. The average U.S. household now has at least 5 radios. Of the total number of radio stations now on the air, approximately 31% began operation during the past decade.(3) The above trends are indicative of a communications media that is alive, well and growing in spite of the "video revolution".

Figure 1 illustrates the fact that in 1979 Americans spent a total of 9.8 billion dollars on three interrelated audio sources; radio sets, HI-FI phonographs and records.(4)

EXPENDITURES ON LEISURE TIME PRODUCTS (1979)

Radio Sets	$3.5 billion
Hi-Fi Phonographs	$3.3 billion
Records	$3.0 billion
General Interest Books	$3.0 billion
Movies	$2.65 billion
All Spectator Sports	$2.3 billion
Musical Instruments	$2.1 billion
Film Developing	$2.0 billion

FIG. 1 Audio Entertainment Is Big Business!

Let's take a look at what types of aural services could be provided as part of a cable entertainment package and the reasons for considering them.

At this point in time, our prime source of audio service will be derived from local off-air and imported off-air FM radio stations. It should be realized that FM radio is growing at a

remarkable pace both in quantity and quality. 48% of the radio stations on the air today are FM. People other than "stereo nuts" actually listen to FM radio. In fact, FM now commands approximately 51% of the total radio audience.[5] Current construction permits exist for 366 new radio stations; 75% of these will be FM. Figure 2 compares the growth of broadcast TV, AM and FM from 1946 to 1981.

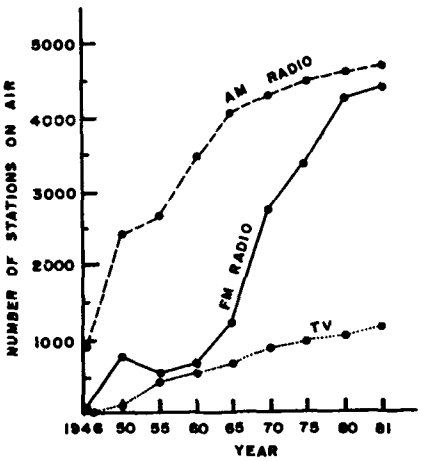

FIG. 2 GROWTH COMPARISON FOR U.S. AM, FM, AND TV BROADCAST STATIONS. AUDIO IS ALIVE AND WELL!

In September, 1979, United Video began providing the signals of WFMT-FM in Chicago as a sub-carrier to their WGN-TV feed on transponder 3. This first radio "superstation" fulfills a need in many markets that have no outlet for consistent high quality fine arts broadcasts. There are currently 500,000 actual or committed cable subscribers capable of receiving the station. WFMT has just received a major industry award as "Best FM Station Of The Year", and generally is regarded as being on the leading edge of technology.

An interesting opportunity for cable radio has been created by the FCC's recent approval of the Magnavox AM stereo system. AM stations will now be jumping on the stereo bandwagon. In fact, many have already purchased and installed stereo production equipment in anticipation of this move. As a result, the public will become even more "stereo conscious" but will probably be reluctant to rush out and buy new radios just to receive the AM stereo signals. This is a golden opportunity for cable systems to acquaint subscribers with the "new sound" from their favorite AM station by taking stereo feed from the radio station and providing a high quality FM stereo signal for home use.

Local origination possibilities for cable FM provide an outlet for economically sound creativity. Covering events such as council meetings, athletic events, etc. can be done with audio for very little capital outlay. Local educational institutions can program aural service for a fraction of the cost of video.

The Catel Corporation has mentioned other audio service possibilities in their literature from time to time. Services such as WWV (accurate time), NOAA weather, synthesized stereo TV sound, and foreign short wave broadcast signals can easily and economically be provided in the FM band. The "product mix" can be tailored to the social and ethnic background of the subscribers base.

There will also be many future aural services available via satellite. In addition to WFMT-FM, at least 7 audio entertainment sub-carriers are or will be available on Satcom I. National Public Radio is currently developing an ambitious program of supplying at least 20 audio entertainment channels via Westar. While primarily aimed at providing PBS radio stations with high quality programming, PBS is interested in working with cable operators to provide outlets for additional aural services aimed at the home market.

SOME GRASS ROOTS MARKETING

Very little has been written regarding actual FM service success within the cable industry. There are, however, many indications that seem to verify the viability of the concept. The public will become even more stereo conscience with the big push for AM stereo and renewed interest has been expressed in stereo audio for broadcast TV. At the recent National Association of Broadcasters convention, NEC America, Inc. described a new UHF TV exciter with stereo audio.

The few examples which relate directly to the cable industry are encouraging. Mr. Neal McLain, in a recent paper[6] indicated that with a well planned and marketed aural service package including 29 signals in the FM band a 16% actual FM penetration was realized. Gill Cable in San Jose is realizing a 27% FM penetration. 12,500 new second outlets were ordered within a few months of initiation their audio service, which includes FM radio, unique radio service broadcasts, and synthesized stereo pay TV audio.[7] UA-Columbia's San Antonio system has approximately 34% of the subscribers to date electing to connect their FM receivers to the cable in spite of the fact that no unique audio services are being offered other than imported broadcast FM.[8]

A recent chain of events in San Angelo, Texas seem to verify my claim that audio services are marketable. The off-air market in San Angelo consists of 4 AM's and 3 FM's with 43% playing country and western music. Prior to September 1979, 5 imported FM's were available on the cable offering additional variety. Beginning in September 1979, a Dallas rock station (KZEW) was added to the San Angelo cable system. Curiousity prompted me to contact several local stereo shops

to see if this addition has any impact on their operations. Comments and observations with respect to that little survey were as follows:

1. Since KZEW went on the cable, sale of splitters and RG59 have increased at an unprecedented rate. One store that had not sold 50 splitters in 4 years now orders and sells 50 splitters and 1000 ft. RG59 per month.

2. Shop owners estimate that at least 80% of the stereo receivers they sell are connected to the cable. With at least 2000 units per year (all with 300 Ohm antenna terminals!) being sold in San Angelo, the cable FM market appears significant.

3. The number of KZEW car bumper stickers in San Angelo is amazing. There is no way the people can get the signal by any means other than cable.

PAY RADIO???

As you can probably tell by now, I am sold on the concept that audio is a significant force in today's consumer entertainment portfolio. The time is right for the cable industry to provide a quality product at a reasonable price. UA-Columbia is studying the idea of providing a premium "protected" audio service --- pay audio! Yes that's right --- pay!! The proper blend of market forces and technology exists today to make an "audio tier" a profitable venture. Both positive and negative means of security are under investigation and such a service will be implemented for the purposes of evaluation.

SOME CLOSING "HI-FI SKY" REMARKS

Within the field of audio services you will find a variety of tastes and interests as broad as the span of human interests. You will find several groups of people intensly loyal to (and willing to pay for) one format or another as well as people who listen to a little bit of everything. The point is that by offering an audio service that contains a product mix tailored to the subscriber base, the cable operator can capture a major portion of the <u>total</u> home audio market.

Some "Hi-Fi Sky" predictions that I personally believe will happen during the next 5 years are:

...AM stereo will grow, making the public more stereo conscience. Since AM stereo cannot match FM stereo's overall quality, the result will be even more popularity for FM.

...quad audio will continue to flounder until the industry adopts technical standards.

...the present undercurrent involving better TV audio will result in broadcast stereo TV audio becoming fact. This will be a higher priority than quad audio.

...FM audio via cable will become a healthy profitable part of the cable entertainment service. New satellite services will help cable operators create unique audio packages unavailable to the non-cable subscriber.

...digital audio techniques, just beginning as a commercial venture, will continue to increase the public's demand for <u>quality</u> sound. By 1985, totally digital audio equipment will be appearing in the home.

In summary, take a good look at your radio -- let your imagination go to work --- maybe then you will see the picture better.

REFERENCES

(1) "Radio Station Proof of Performance Via Satellite", C-ED Magazine, December, 1979 p. 41

(2) "Summary of Broadcasting", Broadcasting Magazine, April 7, 1980, p. 156

(3) "Sounds of Success", Newsweek Magazine, December 3, 1979, p. 132

(4) "The Changing Game", BM/E Magazine, February, 1980, p. 44

(5) "Ibid"., p. 40

(6) "Why WFMT? A look At How It's Worked In Madison", Mr. Neal McLain

(7) "CAFM Yields More Subscribers, Increase Revenues", Catelgram, Vol. 5, 1980, p. 1

(8) UA-Columbia Provides A Free FM Tap In San Antonio If The Radio Is Within 10 Feet Of The TV Set.