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MIXING FOR NICAM

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INTRODUCTION

This paper describes the recent practice of mixing television sound in stereo, with special reference to the Nicam transmission chain.

MIXING FOR NICAM

The exciting dawn of Stereo sound along with television pictures has finally been achieved. The full acceptance of a really large audience has yet to be fully realised, providing us with the opportunity to experiment in this new challenging medium.

Historically, television sound has always had the rough end of the deal, being a necessary evil in the face of the dominant picture. Invisible sound for the most part, with microphones playing an essentially hidden role in the overall illusion. In the monophonic world, the single dimension can hide a multitude of sins. The effect of masking by frequency and level works very well in keeping costs down. Re-takes for the odd noise, talkback breaking through from cameraman's cans, off-stage coughs, shuffling feet, all become disturbing when they are localised and not intended for transmission. Stereo unmasks them all, as they creep out sideways from under the dialogue.

A large proportion of television is made as a giant jig-saw puzzle, where odd lines of dialogue, close-ups, explosions are intercut after the event so that the precise stereo picture cannot be assembled until the post-production stage and the original shoot is a distant memory. The cinema's answer to all this is to keep the dialogue essentially monophonic, and apply layers of stereophonic atmosphere and music over the top (sometimes literally!) of it to present the illusion of a stereo soundstage.

The Nicam signal uses a compansion technique reducing an original 14 bit sample to 10 bits by ignoring least significant bits at higher levels. Pre-emphasis is applied to the signal prior to the digital compression which helps to mask quantisation effects. This has the effect of reducing the headroom at high frequencies.

This problem was severe in the early days of Nicam. We had pen recorders attached to the output of various live studios and on OB units. One particular programme, Summertime Special from Bournemouth, demonstrated the severe lack of headroom after J-17 pre-emphasis had been applied. The programme was correctly modulated for normal transmission, i.e. peaking to +8dBm on a PPM, but the entire programme showed severe clipping after pre-emphasis. The applause from the audience of 5000 people was particularly nasty as it contained a large amount of hf. As a direct result of this and experience from others, the modulation level for Nicam was reduced by about 12 dB to provide a necessary safeguard against such overmodulation.

MIXING FOR NICAM

The dynamic range of the Nicam system is trumpeted as being of enormous benefit, a theoretical 84 dB from 14 bits. The real wind of change that Nicam blew in is the increased use of digital technology to record and post-produce the sound. Synchronisable DAT machines as exemplified by the Fostex D-20 became available just as we needed a transparent recording medium to work with. In 1986 the AMS Audiofile became available as the first workable digital editing system for television sound production and post-production. The transmission and production chain was examined in fine detail for the first time since the introduction of colour.

The instinctive reaction of production teams is to want stereo sound at no extra cost and taking no extra time to shoot or post-produce.

The infra-structure of ITV had to change to accommodate the additional information. Every studio centre has had to be able to handle stereo in its Presentation and Master Control areas, along with videotape and production sources. In general, the structural changes to areas was minimal. The provision of two loudspeakers where there was originally one, was achieved without costly building work, relying on the original monophonic IBA guidelines for control rooms. The ITC has upped the acoustic standards to far more realistic, some would say overly optimistic, levels. This will become a contractual responsibility on the new franchise operators. Rooms will have to comply to a standard broadly similar to the old IBA local radio standard, where good separation and low NR figures are the norm.

There is an increased use of independent facilities by broadcasters, and this is particularly true of multi-track trucks, vehicles which can record onto 24-track tape machines on location and/or simultaneously mix to stereo. These have only a basic degree of acoustic treatment, relying on large amounts of soft carpeting glued to the walls. The treatment is usually sufficient to stop there being any nasty refections at the mixing position, with the loudspeakers being equalised, using multi-band graphic equalisers. This is to produce a smooth frequency response at the mixing desk. It is known that small rooms have worse standing wave problems than large rooms, and mobile trucks with parallel walls have quite predictable standing waves. Essentially though, the mixing position is symmetrically placed. The trucks do an enormous amount of work, ranging from rock and roll to Mahler's 8th Symphony. Some of this material is re-mixed in proper controlled

acoustics, but much of it cannot, as it goes out live. There is little point in arguing a better acoustic environment, as increased treatment would both reduce space and increase the hire costs.

There is the question of how wide should the stereo image be? Stereo televisions usually have speakers either side of the screen, typically speakers are placed some 60 cm apart on a domestic set, even when Nicam is fitted. There is no way the monitoring angles achieved in control rooms relate to the angle subtended by the viewer, unless the set is placed in the middle of a hi-fi rig. In how many lounges, or sitting rooms is that possible; how many partners really tolerate a set in front of the fire? Not good for the set itself either. It is a 10 degree domestic spread vs a 60 degree control room spread. There is one method of achieving a better stereo spread, and that is to increase the width of the out of screen sound when 'panned' in the mix. Possibly wider than would be normal for a radio broadcast.

However, there must not be any conflict with the picture. Someone calling off-screen left must appear from the left when in vision. On screen action should have restricted width to prevent eye/ear conflict. The principle of thirds does seem to apply. Some sets rely on amplifying phase differences to introduce a degree of spread. The low frequencies start to suffer, but with essentially small speakers the effect outweighs the loss. Broadcasters rely on a secondary monitoring system to check domestic compatibility. A wider mix was used in the early days of disc stereo as a sales pitch. "Never mind the quality, listen to the width" was probably the underscore for some of Decca's Phase 4 recordings which provide fine demonstrations of the ping-pong stereo school of mixing. Commercially, they were terribly successful, purist they were not. In order to boost Nicam's perceived benefit in the home, maybe some extra width in off-screen effects and music would not go amiss?

The element of experimentation should not be a surprise. Television sound engineers have been mixing in stereo for some time, but the vast majority of the experience has been in providing excellent mono (to VHF radio standard) for the viewer. It is just that Nicam delivers stunningly transparent sound for the 4 million people who have paid the money to have better sound. It is probably 3.9 million more people who really appreciate television sound than existed before.

MIXING FOR NICAM

The vast majority of the great British public are quite happy with their 3 inch speaker squarking in mono. So where should the concentrated effort go when it comes to mixing? Providing that sufficient checks are made to safeguard the interests of this very significant majority, the baulk of the monitoring should be for the people who have paid to have an increased service. There are literally "commercial" pressures when television commercials are made to provide the most arresting sound and this inevitably will mean more and more stereo commercials. An out of phase transmission, through Nicam, of a mono production, provides nearly perfect cancellation, i.e. total loss of mono sound. The 4 million Nicammers notice only an interesting increase in width!

The whole monitoring system used over the years for measuring the electrical level of the left and right signals, has largely relied on mechanical peak programme meters. These tend to be very good for line-up and their subjective correlation to the sound is very good. However, whilst using digital systems, like Nicam it has been found that these meters can significantly under-read fast transients, and digital clipping is occurring, especially after pre-emphasis. Fortunately, digital bargraph-type meters are available, some like the Chromatec burn the signals into the television monitor making it easier for a mixer to assess the correct levels.

It is easier to achieve a pleasing stereo mix than a pleasing monophinic mix, to some extent the human brain constructs an overall picture localising the interesting sounds for itself. The overall perception of the sound picture is immediately more involving with stereo. Television is, after all, just an illusion with pictures flickering with a fresh picture every 25th of a second. The illusion is more complete with stereo sound. The Nicam transmission system delivers other goodies too. Dolby surround-sound information is essentially phase encoded on many recent feature films. The very nature of the Nicam system preserves this phase information extremely well, and surround-sound information arrives intact enabling Dolby surround decoders to work well at home. Toshiba, amongst others, has taken advantage of this and incorporated this into some of their Nicam sets. Some franchise applicants have suggested that they may experiment for this audience too.

The future is exciting, the number of Nicammers will increase, and the Cinderella of broadcasting, television sound, is going to have a ball.