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A REPORT ON THE APRS - BTG AMBISONICS SEMINAR

The Ambisonics seminar organised jointly by the APRS and the British Technology Group (BTG) drew some sixty interested producers, engineers and others to the Russell Hotel in London last month. Originally planned as a one-day event it was so well subscribed that it was eventually repeated on a second day.

In his introduction to the theoretical and technical side of ambisonics Michael Gerzon, the principle inventor of the technology, noted that stereo recording has now been available for 30 years and can be capable of such excellent results that it was fair to ask why anyone should want anything more.

The answer, from which came the reason for Ambisonic research, is simply that stereo is limited in that it is impossible to deliver complete naturalness of sound from two speakers; the ambience is collapsed into the front stage position where the main sound is situated.

He explained that Ambisonics is essentially a technology for handling surround sound. He stressed that although the system was originally designed to convey the sense of ambience and to create a greater participation and involvement with the listener in the recorded sound; it is not confined to subtle effects and that artificial soundfields can be created for spectacular effects or sound gimmickery in the world of multitrack and pop music.

The professional recording format for Ambisonic surround sound is known as B-format. For the best horizontal surround sound, there needs to be three information channels - 'X' a forward facing figure-of-eight gradient signal; 'Y' a sideways gradient signal and 'W' the omnidirectional pressure signal. From these three it is possible to accurately decode any position on the circumference of a circle. When a fourth gradient signal 'Z' is added (vertical figure-of-eight) directions about a full 3-dimensional sphere can be accurately decoded.

A complete full-sphere B-format signal is available from the output of the Calrec Soundfield microphone. The Soundfield also produces a very accurate and flexible stereo output which is derived by manipulation of the B-format signals in the control unit. In many applications the use of one microphone, however versatile, may not satisfy the artistic concepts of the engineer or artist. Thus the Ambisonic Mastering Package (AMP) was developed by Audio + Design Recording, for multitrack and spot mic applications.

B-format is essentially a storage and manipulation format and will not normally be used on transmission because it cannot provide a two channel surround signal that is stereo-mono compatible. It would be technically possible to encode B-format into any surround sound format

that may find favour (eg SQ or Dolby Stereo subject only to the limitations of such formats). The longterm argument and real commercial attraction for the audio industry of Ambisonic technology lies in its so called 'UHJ' encoded transmission signals. It was well emphasised that there exists a fully compatible hierarchy of 2, 3 and 4-channel UHJ formats that open up, in the longer run, the prospect of full periphonic recordings that can be reproduced well in mono, stereo, horizontal surround or full-sphere, depending on the level of decoding.

In his opening remarks, Gerzon stressed that very careful attention had been paid to the artistic quality of the surround sound in arranging the fold-down to stereo. "To get full surround sound you have to decode the UHJ signal and turn it into loudspeaker feeds which take account of the ear and the brain's workings - to create the illusion of surround sound. This is very complicated signal processing - the result of the accumulation of many years of work in different countries." Naturally the present emphasis is on encoding material for 2-channel transmission and decoding. Whilst 2-channel UHJ is not quite as precise as 3-channel, it is usually considered a very acceptable and effective improvement on stereo. Because of the design emphasis, UHJ has excellent mono-stereo compatibility and seems to give an improved stereo definition and robustness when replayed conventionally; the system has something to offer even those whose prime consideration is good stereo or mono.

During the panel discussion, Richard Elen stated that several producers have noted that they get better conventional stereo reproduction as well as better mono, by encoding in 2-channel UHJ surround sound. He had himself found it very useful for the library music in which he specialised (most of which is currently used in mono).

Stephen Nicholas, president of Nicholas Communications, Virginia, and producer of the Washington DC Video Postcard enthusiastically explained that he had used Ambisonic encoding primarily for its exceptional mono quality, whilst of course wishing to have a stereo capability. In addition he had been able to experiment with the surround sound aspects which he expected to prove an added bonus that could increase product life at a later date. He had been delighted that this quality had been recognised by average people who felt that the sound they were used to on their television, had somehow been transformed.

During the discussion, panel member Brenden Hearne told how he had been recording with a Soundfield microphone and encoding to UHJ for some six years; whilst it was not possible to say that people bought his records because they were Ambisonically recorded he had had many positive comments on the excellent stereo sound quality of his 'Music from York' label productions. He explained that for his type of work he was able to keep his equipment to a minimum, using the Soundfield mic and its control unit, and a UHJ encoder onto a Sony F1 digital recorder.

In a domestic system a minimum of four speakers are required. Richard Elen explained how these can be small units - "With four speakers, power levels are reduced and it is surprising how the low frequencies are reinforced with speakers working in a surround array." Troy Ambisonic were able to demonstrate a most effective system, making use of the four

speakers quite commonly to be found - in the car! The domestic decoders include a super-stereo (SS) decode mode which was particularly effective in the car demonstration and gave a dramatic improvement when standard stereo material was reproduced. This seems an obvious environment in which to launch the system to the public.

The Troy decoder is the first to be mass produced and will be on sale for ninety pounds, plus the cost of an additional amplifier pack. It has just been reported that a Reading car-stereo dealer, on receiving Troy's promotional information (and with no previous awareness of Ambisonics), placed an order by return! This could well herald a real break in the chicken-and-egg syndrome: 'no decoders - no software; no software - no decoders', that has been so eagerly sought by the supporters of Ambisonics. Although there are several hundred UHJ records (eg the Nimbus catalogue are all UHJ encoded), most are somewhat specialist in orientation, with the first pop productions only just becoming available (the latest being an Alan Parsons album shortly to be released).

Nigel Branwell, president of Audio + Design Calrec Inc, based in Seattle told how some of the public broadcast stations were recording programmes and transmitting UHJ. One such was a rather avanteguard opera with action all over the auditorium; this had been encoded using spot mics into the B-format pan-rotate unit of the Ambisonic Mastering Package and the producers had been delighted with the result. Other information from the USA included the fact that a number of stations and television broadcasters had started to use the Transcoder (a UHJ encoder with stereo inputs) to transmit an enhanced stereo signal - on normal stereo receivers it apparently gives a wider stereo image.

Gerzon pointed out that it was possible to decode from video or from FM broadcasts, as well as from the normal music carriers (disc, cassette or CD). He suggested that the use of Ambisonic sound recording for video presents particularly exciting prospects, allowing the viewer/listener to be placed within the scene. With its great dramatic potential (for plays or news, for example) it is, he asserted 'far more important than the advent of HDTV.

During the Friday forum some doubts were expressed concerning the additional problems of matching picture and sound perspectives; Mike Beville, chairing the discussion, drew attention to the fact that the BBC had been working for the last two or three years on stereo-to-picture techniques so we could not expect instant solutions for surround and periphony. He suggested that the success of Dolby cinema surround stereo (with several hundred encoded video film titles on the market waiting to be decoded) had almost certainly increased public awareness of surround sound and that ambisonic techniques would soon be in demand for surround video productions. Geoff Barton, BTG consultant, stated that perhaps the most important aspect of the seminar was to interest recording engineers to go out and begin using the system and exploring its potential. The techniques would then be developed as they had been with stereo and experienced engineers would be available to exploit demand for the new dimension.

At another point in the forum it was suggested that unless the

technology was properly marketed on a world-wide basis it would not take-off. Roy Easson project manager for BTG explained that BTG's remit was to assist in developing the technology (they have spent about a half-million pounds over the development period of fourteen years) and to find a suitable partner for the subsequent marketing operation. He believed that the high level of interest now generated - and the purchase of an option by Maple Technology referred to in his opening statement, would mean that proper funding for marketing the project would now be available. A small royalty is paid on hardware by licensed manufacturers so that the right of use is paid for in the purchase of equipment. A free license is available to software producers who wish to use the Ambisonic logo on their product.

Whatever the ultimate success of Ambisonics on the domestic front, there will nevertheless be many interesting commercial applications (audio-visual, theatre, son-et-lumiere, pleasure parks, HDTV and special cinema presentations - to name but a few) that the specialist could profitably develop.

The workshops demonstrated a domestic surround system reproducing examples of UHJ encoded CD discs and records plus a recorded excerpt from one of the KWMU station broadcasts decoded through a Minim decoder. Another emphasised video and showed excerpts from the Nicholas Washington Video Postcard, along with an example of a pop video created and shown courtesy of Trillion Pictures. A simple UHJ encoding mixdown set-up was demonstrated from 24-track pre-mixed to 8-track using the ADR Ambisonic Mastering Package. The system is uncomplicated and can easily be added to any professional mixing desk. The reverberation systems used on the demo were supplied courtesy of Klark-Teknik.

The Transcoder is the essential piece of kit necessary to start recording and encoding Ambisonically to 2-channel UHJ. At its simplest this could be a wide (variable θ - 180 degrees) conventional front stereo stage and a reverberant stereo (variable θ - 150 degrees) rear stage. In stereo the rear stage folds over behind the front stage - just where you'd expect the reverb to be! Not complicated, and requiring very little modification of recording techniques whether pop or classical!

The ultimate in surround sound, is termed periphony which places the listener within a 3-dimensional sound-sphere, by recording and reproducing sound from any direction. Natural sounds recorded with the Soundfield microphone are totally convincing and can be reproduced with as few as six loudspeakers in a small system. Equipment that has been so far developed for periphony is still fairly basic; though full periphonic productions are possible now, as evidenced by several BBC experimental works.

Those who attended the seminar, were able to experience an eight-speaker periphonic system developed by Calrec Audio in the late seventies, as one of the workshops. The conventional four speaker horizontal array was augmented by a centrally placed vertical array - bottom both sides; top both sides. The system crossed-over below 100Hz to two bass enclosures placed to the front of the array. The demonstration effectively showed, in sound effects, music and drama recordings, how

B-format Ambisonic recording can create a convincing full-sphere surround sound.

The demonstration was brought to an excellent conclusion with an excerpt from a BBC recording made as long ago as 1977 by BBC Scotland - represented on the discussion panel by Chilton Inglis. He explained that they had had to contrive their own encoding of spot effects into the B-format signal and develop their own decoder, since at that time only the Soundfield mic existed. The periphonic experiment entitled 'The Seventh Church' was an historical sound montage reflecting the evolution of European society over recent centuries. It very successfully exploited the possibilities of the then infant technology (and which incorporated what Gerzon justifiably described as 'possibly the most dramatic sound of all - the guillotine blade dropping onto the listener's neck!').

END

TA/MJB