

SOUNDFIELD MKV

MICROPHONE SYSTEM

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evaluates the SoundField Research, MKV — designed to provide a fully immersing sound envelopment.

As music production for multichannel deployment becomes an increasingly common practice, new methods for recording original tracks and novel microphone techniques are being attempted. (In the last issue of *Audio Media*, I explored some of these attempts for multichannel music tracking.) However, one of the most versatile methods for recording in multichannel is the result of a microphone technology, which is not new at all.

Decades Of Development

The SoundField microphone has been around, in one form or another, since Michael Gerzon proposed it in the 1970s. Michael Gerzon's full proposal called for the SoundField microphone to deliver a 'periphonic', or fully immersing, sound envelopment. This periphonic output is developed by combining Mid-Side

Historically, the reputation of various SoundField microphones was somewhat murky, depending upon who was manufacturing the unit at the time. However, in recent years, SoundField Research in the UK has taken over manufacturing and has been further developing the SoundField line of microphones and control units. The results are quality workmanship, good engineering and excellent specifications.

In the professional audio community, indicating a preference for recording techniques involving an Ambisonic approach might be somewhat akin to 'coming out of the closet'. But, just as alternative lifestyles are often misunderstood or misrepresented, much of what is reported or presented on the topic of Ambisonics is unrepresentative or, indeed, is simply based upon an improper understanding of the correct principles involved. There are many fine references available on the subject of Ambisonics, and I encourage you to check out several of the websites devoted to the subject.

The Ambisonic Homepage, administered by Dave Malham at the University of York, may be found at www.york.ac.uk/inst/mustech/3d_audio/ambisonic.htm; Richard Elen maintains the Ambisonic Network at www.ambisonic.net; and Jeffery Stephen Bamford's thesis on Ambisonic systems may be found at <http://audiolab.UWaterloo.ca/~jeffb/thesis/thesis.html>.

The user of a SoundField microphone should not base their use of the SoundField MKV microphone solely on Ambisonic principles. Instead, it might be looked upon as an incredibly engineered point source array of phase-coherent, Mid-Side configured microphones.

Pyramid Power

Like its previous incarnations, the SoundField MKV has four diaphragms mounted very closely to one another in a tetrahedral array. This tetrahedron is shaped like a three-sided pyramid with a base. Each of the four capsules represents one of the faces or the base of this pyramid. The entire pyramid is then tipped 45 degrees on its axis. (This should give you some idea of how the capsules are arranged in the microphone.) Should the output of each of these four elements be routed directly to a recording device, this would be termed 'A' format. A format is the non-matrixed output of the SoundField microphone. The real power of the SoundField microphone, however, comes from extremely ingenious Mid-Side combinations of the four elements to produce the B format outputs utilized in the SoundField control unit. Michael Gerzon developed the mathematical models for obtaining these matrices, which were a four-way derivative of the Mid-Side microphone techniques proposed by Alan Blumlein in 1931. In addition to the four B format outputs supplied by the SoundField MKV control unit, a stereo two-channel output is also provided. This output is a matrix-encoded format version of the B format and is called 'C' format. The C format outputs are derived from a matrix proposed jointly by Michael Gerzon and the BBC. For this reason, the C format outputs are also sometimes designated by their development acronym: 'UHJ'.

Abundant Control

I have utilized the predecessor SoundField MKIV on a ä



combinations of Gerzon's SoundField microphone in such a way that height, width, depth and omnidirectional pressure can be recorded on four separate channels. These channels, called the 'B' format outputs of the SoundField control unit, are labeled 'X' for depth, 'Y' for width, 'Z' for height, and 'W' or omnidirectional pressure. The full implementation of Michael Gerzon's techniques became known as 'Ambisonics', a recording and playback methodology employing matrix encoder/decoder designs that deliver a fully periphonic sound field. While it is important to acknowledge the Ambisonic heritage of the SoundField mic, it is equally important to acknowledge that the mic is well suited to many other applications, as will be apparent later in this article.

ä variety of recording situations and was immediately impressed with the noticeably quieter response of the MKV. The MKV also appeared to have more output than its predecessor. Another difference was the control unit. The MKIV control unit was a freestanding box with a movable front angle support. The MKV control unit is quite a bit more robust and is intended for rack mounting in an enclosure standing 3U high.

The control unit's front panel features a variety of controls, all designed to provide the user-flexible operation of the SoundField microphone. The 'Gain' control provides 30dB of gain with detents at 10dB steps. The 'Fine Gain' control provides adjustable gain over a 10dB range following the 'Gain' control.

The next controls are proprietary to the SoundField's operational principles. The 'Azimuth' control electronically rotates the microphone throughout 360 degrees on the horizontal (Y) axis so that it may 'point' at any location. The 'Up/Down' elevation control varies the angle of the microphone with respect to the Z axis ± 45 degrees. The 'Dominance' control electronically alters the output of the microphone on the front/back (X) axis, thus allowing movement toward or away from a sound source. The 'Angle' control varies the stereo image produced by the SoundField MKV from zero degrees (mono) to 180 degrees (extra wide stereo). 'End' and 'Invert' switches allow for electrical repositioning of the SoundField MKV so that it may be hung upside down or aimed at the end of a fishpole boom. To prevent accidental readjustment while recording in a live situation, the 'In' switch may be disengaged. The 'Pattern' control varies the polar pattern of the SoundField MKV and is continuously variable from omni to figure eight with a cardioid position in the middle setting. The 'Dub' and 'Tape' switches allow the user to route the four discrete B format signals into the control unit for stereo encoding either live (off-tape) or in post production. With the 'Format' switch, the user is allowed to directly control not only the stereo output of the SoundField MKV but the B format outputs as well.

Monitoring And Calibration

Monitoring of signals on the SoundField MKV is accomplished with a four-channel bar graph meter. This meter displays the output level of X, Y, Z and W of the B format output, or if switched via the 'Stereo Monitor' switch, shows L/R, and Mid-Side outputs. Signals present at each of the four capsules on the SoundField MKV microphone can be monitored aurally via the use of four 'Solo' switches. The solo signal is post trim and is sent both to the headphone output and the main outputs. Since this would represent a destructive solo, an LED functions as a visual warning if it is engaged. Low frequency roll-off is accomplished with the switch labeled '40', which provides an 18dB/octave cut

beginning at 40Hz.

Level calibration of recorders or consoles connected to the SoundField MKV may be accomplished with the 'Test Oscillator'. The output of the oscillator is a 1kHz tone calibrated to 0dBm. Each of the four B format outputs of the SoundField MKV sends a different pattern of tone on/off sequences so that the channels may be identified, if necessary, upon a later date. The stereo outputs of the SoundField MKV may also be switched from UHJ format to un-matrixed Mid-Side via the 'M/S' switch for later sum and difference decoding.

Specifications And Performance

The published specifications of the SoundField MKV indicate the marked improvements achieved by SoundField Research compared to the MKIV. The sensitivity of the microphone to the front is 122dB at 0dB gain. Dynamic range specified at five percent THD is 145dB SPL. The specified frequency response in cardioid mode is 20Hz to 20kHz. The self-noise figure is a much quieter 14dB A-weighted IEC 179 standard in cardioid response setting. Listed maximum output level is +22dBu and the balanced nominal output impedance is specified to be 100 Ω .

I recently had the opportunity to use the SoundField MKV in a series of recordings. In one situation, the SoundField was used as a room mic on a jazz session. For a pop recording session, I utilized the SoundField as an overhead drum microphone. In both cases the outputs of the control unit were all routed directly to tape. Outputs during the tracking session were brought back up on the console.

Set-up of the microphone was straightforward. It is supplied with a 20-meter, 12-pin cable, which carries all of the outputs of the four capsules back to the control unit and supplies phantom power as well. The multi-pin connector connects to the base of the microphone and is screwed tight with a threaded collet. The only drawback to my use of the SoundField was that I had to leave the studio door open just a bit to allow the cable passage into the control room, where it could be hooked up to the controller unit. This situation is easily remedied with XLR adapter cables optionally available from SoundField.

In both recording situations, the SoundField MKV worked extremely well. Just one note of caution: be prepared to spend some time with this unit. Its powerful ability to alter patterns of response, angle and dominance make it such a flexible recording device that you'll be tempted to try everything out at first. While tracking I was fortunate enough to record not only the stereo UHJ outputs of the control unit, but the four B format outputs as well. In initial mixes, I was able to route the four B format tracks back to the 'Tape' inputs on the control unit. Doing this I was completely free to reorient the microphone in the room after the recording

had been completed and the musicians were long gone! This feature alone would make this microphone system absolutely worth its price. But, in order to have this type of flexibility, you must have the ability to record those four extra tracks.

I must also say that I was extremely impressed with the stereo UHJ outputs as well. While tracking I was able to monitor these outputs via headphones at the control unit, or I was able to solo the pair of tracks returning from tape. The SoundField's proprietary controls made positioning of the microphone remotely from the control room a breeze: too much room, back off on the Dominance; facing the wrong direction, rotate the Angle and Elevation controls; pick-up pattern too wide, change the microphone polarity. And, of course, imaging and phase coherency was great due to the extremely close proximity of the elements in the capsule.

5.1 Ready

But what about the multichannel implications for the SoundField MKV? SoundField Research will be releasing a full 5.1 implementation of the MKV before the end of the year. Additionally, some second-party developers already offer products that can accept either the four-channel B format outputs or the two-channel UHJ outputs and convert them to a 5.1 environment. These products include the Audio Dimensions Azimuth SoundField controller and Ambisonic to 5.1 Joystick Panner (www.zynet.co.uk/audiodim/products.htm). Their products have also been tested for use in live shows by Britannia Row, the live sound company for Pink Floyd. Another decoder, designed by Canadian Michael Dunn, is available through his Cantares operation (www.cantares.on.ca/decoder.htm). The Meridian 565 Surround Controller and 861 Reference Surround Processor include Ambisonic decoding capability (www.meridian.co.uk).

Ambisonic purists might shudder at the concept of 5.1 and pair-wise mixing styles, but it must be admitted that, as a tool, there may be no more flexible microphone array than the SoundField MKV, so it does seem a natural for the task. o

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