



Digital Soundfield

Hugh Robjohns MIBS gets his hands on the latest digital SoundField microphone and processor.

The SoundField microphone came from the Ambisonics work of Michael Gerzon and Peter Craven in the early 1970s, and is essentially an extrapolation of Blumlein's coincident microphone work 40 years earlier. Ambisonics is a brilliant concept, the idea being to recreate accurate surround sound from a B-format source. It was way ahead of its time and suffered terribly by association with quadraphonics in the late 1970s. Today it is largely overshadowed by the universal adoption of the significantly inferior cinema 5.1 format - but there are companies that still promote and support it.

In the meantime, the demand for surround sound audio for HDTV, has spurred the professional interest in acquisition techniques, and Gerzon's B-format is highly appropriate to this market. Essentially, the B-format is a three-dimensional Mid-Side array. Imagine a stereo MS pair comprising an omni Mid capsule and a figure-of-eight Side capsule facing left-right. In B-format terms, these are referred to as W and Y, respectively. Now imagine adding a second fig-8 capsule orientated front-back (X), and a third

orientated up-down (Z). All four capsules are coincident, and their WXYZ outputs are collectively known as the B-format. By combining these four signals in various combinations and amplitudes, just as in MS decoding, it is possible to create the equivalent output of any number of virtual microphones pointing in any direction and with any first or second order polar pattern from omni through to figure-eight. Furthermore, as a coincident system there are no phasing problems when folding down virtual surround formats to stereo or mono, and it's also highly efficient in terms of storage. Four source channels can be decoded to reproduce any surround format you can think of, including those with height information if required.

The SoundField microphone is now produced by an independent company, and the original system is in its MkV revision. A simpler, more cost-effective version is called the SPS422B and a portable model was substantially upgraded a few years ago to the ST350. There is also a 5.1 decoder, the SP451, and a software plug-in equivalent called the SurroundZone. However, with the exception of the plug-in, these are all analogue systems and the extensive signal matrixing involved means that they have always been noisier than more

straightforward microphone arrays. Clearly, digital signal processing was the way forward for SoundField, and that has finally been realised with the DSF-2.

Soundfield DSF-2

Every aspect of this product has been designed afresh, and it uses new, very high quality capsules and impedance converter circuitry with balanced line drivers in the microphone itself. All the matrixing manipulation is performed in the digital domain, and as a result the sound quality of the DSF-2 is an astonishing step up from the earlier analogue units. The analogue bandwidth is much wider than previous models, with corresponding improvements in transient response and phase accuracy. Local power supply regulation within the microphone body has improved the noise performance significantly too, as has the use of balanced line drivers to feed the analogue signals back to the control unit. The digital signal processing is entirely bespoke and, I'm told, 'hand tweaked' to maximise quality and minimise DSP filter artefacts. Throughout development the prototypes were carefully evaluated to make sure that the theory stood up to practical listening tests.

Broadcast Mic

The DSF-2 Broadcast Microphone was developed to satisfy Sky Television's requirements to capture stadium surround sound at Premier League football matches, although it almost seems a waste to employ the phenomenal spatial resolution capability of this mic on something as mundane as football crowd ambience! A variant called the DSF-1 has slightly different interconnectivity and more flexible clocking arrangements, to appeal more to the music studio market, but is otherwise virtually the same.



The DSF-2 microphone looks much the same as earlier analogue generations of SoundField, although the compact 12-pin Lemo connector highlights the revised internals. The microphone is claimed to be able to drive up to 250 metres of cable without loss of quality or signal level, and the maximum SPL is specified as 145dB, with an equivalent self-noise of 13dBA (DIN/IEC).

The control unit occupies 1U of rack space and the rear panel carries an IEC mains inlet with integral power switch, separate fuse holder and voltage selector (230/115V AC). A Lemo connector accepts the microphone signal, while a pair of XLRs provides decoded stereo analogue line level outputs. Three BNC connectors deliver AES3-id digital outputs for both stereo and B-format (W/X and Y/Z). This digital interface is increasingly popular with broadcasters and can drive up to 1km of cable. There is no wordclock provision (in or out) on the DSF-2, but its sample rate can be switched between 48, 96 and 192kHz. (The DSF-1 version uses the more conventional AES3 interface format with XLR connectors, and the stereo analogue outputs have been replaced with wordclock in and out on BNCs. The sample rate options have also been expanded to include 44.1kHz and its multiples up to 176.4kHz, plus external clock synchronisation.)

The microphone's sensitivity is controlled with a large rotary switch on the left of the front panel, adjusting the gain from 0 to 40dB, with LEDs confirming the current setting. Two push buttons accommodate different microphone orientations (end-fire and inverted), while a third activates a fixed threshold peak limiter - an LED illuminates when the limiter is switched in, changing colour when it is triggered. An array of four vertical bargraph meters displays either the B-format signals, or the decoded LR and MS signals, as selected by the adjacent push button. The meters span the range from zero to -37dBFS.

Next is a Mic Rotate section with encoder knob, activate button and angle display. These are used to rotate the microphone's centre-front axis through a full 360 degrees horizontally, either in coarse (10 degree) or fine (one degree) steps. This enables the image to be 'aimed' as desired, or the rear pickup to be auditioned when working with stereo monitoring (or headphones). A stereo output section follows, with buttons to introduce a high-pass filter (50 or 100Hz) and MS encoding, along with the familiar Pattern and Angle controls to determine the



DSF-2 connectivity

characteristics of the decoded stereo outputs. Finally, another pushbutton and associated LEDs controls the sample rate options, while a stereo headphone socket and volume control complete the operational facilities.

Surround Decoder

Producing B-format signals is all well and good, but a further stage of decoding is required to generate 5.1-compatible signals. To that end, SoundField has produced a digital decoder to partner the DSF-2 called, logically enough, the DSF-3. This 1U rack mounting unit accepts either B-format signals from the DSF-2, or A-format signals (such as from the SoundField SPS200 microphone array), on two AES3-id BNC connectors. The appropriate mode is established with a front panel button. Decoded stereo and 5.1 outputs are provided on four more AES3-id BNC connectors, while another pair of BNCs caters for wordclock in and out. The DSF-3 incorporates sample rate converters on its inputs so that the output signals can be produced at a different sample rate to the microphone, or locked to an external clock. The stereo and 5.1 signals are also presented on an ADAT lightpipe port, and a USB socket provides the means for future firmware upgrades.

The front panel features an input level control and the same microphone orientation switches, highpass filter, and rotate controls as found on the DSF-2, to condition the A- or B-format signals as necessary. The next section configures the 5.1 decoder, with independent level controls for all six channels, plus front width, rear width and focus controls. The first two are self explanatory, while the last adjusts the polar pattern of the rear channels to alter the amount of ambient spatial information. Finally, Pattern and Angle controls configure the decoded stereo output. The DSF-3's DSP algorithms are identical to those employed in SoundField's SurroundZone software plug-in.

Digital Audition

I have owned an analogue SoundField SPS422B for many years, and although aware of its limitations I love the soundscapes it produces - but comparing it to the DSF-2 was a startling revelation. The digital mic's resolution in the mid

frequencies and high end is far better, and the imaging clarity is just phenomenal. It's not overdone or artificial in any way - but more like veils being removed to use that old hi-fi terminology. Transient details are crisp, clean and solidly positioned, while stereo and surround images portray totally believable depth and width, with a solidity and naturalness that are completely beguiling. My SPS422B produces impressive surround sound but I've always felt something about it wasn't quite as clear and precise as it should be. The DSF-2 resolves that concern completely, and the sonic improvements brought about by the all-new design and technology really brings the SoundField mic into the 21st century.

Operationally, the DSF-2 is as logical and straightforward to use as any other SoundField, and the Rotate control is a useful feature to have included. The DSF-3 is essentially a hardware version of the SurroundZone that I've been using in SADIE for years, but perfectly optimised for real time applications. Clearly the DSF-2 is targeted at the broadcast market where it will be used with the DSF-3 most of the time, so the inclusion of sample rate converters in the latter to allow synchronisation to an external clock is very sensible. For the studio market, where 5.1 decoding is more likely to be performed in a DAW, the DSF-1 variant incorporates external clock facilities, which makes a lot of sense for that market.

There is no doubt that the B-format is ideally suited to surround sound acquisition, and the SoundField DSF-2 and DSF-3 are very well conceived and engineered solutions to address the specific requirements of the broadcast market. For those unconvinced with, or unimpressed by, previous SoundField systems, I would urge you to audition the new digital incarnation. The improvements are startling and the practicality and convenience is unequalled. Highly recommended.

jbs

Contacts and Prices

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SoundField DSF-2 £6750
SoundField DSF-3 £2475
(All prices exclude VAT)