SOUNDFIELD MKV

'SINGLE POINT SOURCE' MICROPHONE SYSTEM

Widely misunderstood, and even disliked by some, SoundField microphones are nevertheless revered by many. With the introduction of the new Mark V version, MIKE SKEET now seeks to dispel some of the mystery surrounding this highly sophisticated recording microphone system.

Now manufactured by SoundField Research, the SoundField Microphone (SFM) is now available in Mark V form. I have used SoundField Microphones since the early 1980s and introduced numerous others to its virtues. It has variously had a revered reputation, been completely misunderstood, and actively disliked! This review will attempt to wipe away the mystery, in the hope that it will not be misunderstood in the future, and to persuade doubters that to try it is to be converted!

Mechanical Overview

The MkV SFM mic head is of similar diameter to the earlier models but shorter in length. Modern surface mount components in the head electronics make this possible. It is slightly lighter in weight, and the four, gold coloured capsules can be glimpsed through the black grill. A 12-way connector links the mic via a multicore to the control unit. Supplied in a black foam-lined presentation case, it should be treated with the care and respect that any delicate instrument deserves—always put it in its box and not on tables and chairs where it could easily roll off!

The basic package includes a 20 metre multicore cable. In my field of classical music recording, I would regularly need at least twice that length. In fact, 100 metres on a drum is available as an optional extra, as well as 50m, 20m, 1 Om or 5m lengths. Splitter cables are also available to allow coupling up via permanently installed cables, or for use with conventional multicores. Five separate screened pairs are taken up when this is done.

A decent shock-mount is supplied—easily fitted if you first insert the mic and then operate the two clip arrangements, not, as I did at first, trying to force the mic into the already clipped together rings! Interestingly, a foam windshield is also part of the standard kit. Beyond this, there are various Rycote suspensions and windshields available as optional extras.

The Control Unit is the heart of the SoundField Microphone system and the new MkV unit is a 2U rack type, deeper and heavier than the free standing MklV version. The substantial steel case now employed seems to account for this increase in weight. It has a fine design and build quality. It is unique in my experience, with the general run of rackmounting units, in that its access lid on the top, held by 12 screws, is electronically grounded around its rectangle via a compressed mesh system. Inside, the PCBs are now populated with surface mount components.

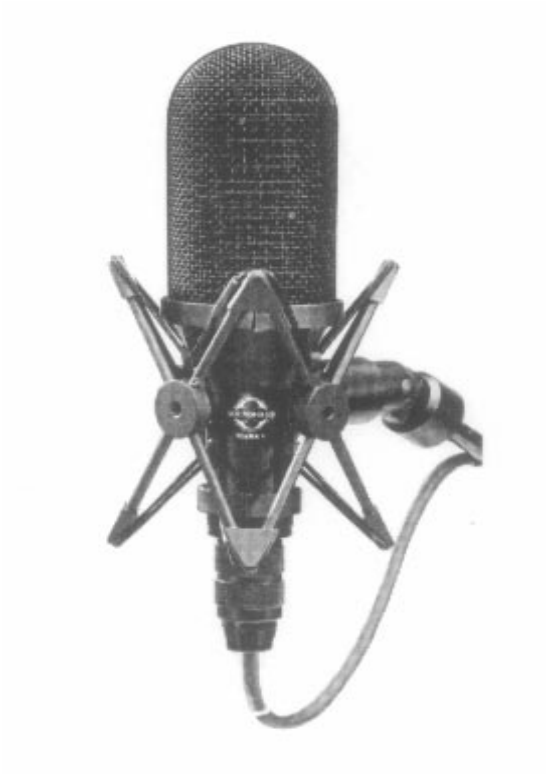
Mains input is by IEC socket, complete with security clip. The supplied IEC lead has a 'moulded on' 3 pin plug, with external access to the 5 amp fuse. Interestingly, the internal PSU is a switched mode type, with the consequent efficiency improvement and low EMI radiation. The user guide needs updating, however, as it still mentions a supply voltage selector on the rear panel, which is no longer present. Still valid though is the comment about having a 'ground' on the mains input, as there is a filter in the PSU.

Stereo left and right output is by XLR 3M connectors, with two more sets of XLR 3s for the B Format sends and returns, of which more later. A headphone socket with separate level control is provided on the front panel. The rest of the Control Unit is the 'nerve centre' for the use of SFM's facilities and a detailed look at that too will also follow.

What It Is And What It Is Not

With any stereo microphone system which is not quite evidently just two mics poking out from their mounting, there is always a chance of it being mistaken for a conventional, single channel mic. In practice, the MkV *is* just 'two mics poking out from their mounting' but it is how it gets there from the actual capsules in the mic head which sometimes takes a bit of time to grasp.

Yes, there are four mic capsules in the mic head, and no, you don't directly alter the 'mix' of these capsules in setting up and using any of the facilities available. The main point to take on board is that the four physical capsules, arranged in a tetrahedral array (Figure 1), are themselves permanently matrixed into four discrete signals which are called the B Format signals (Figure 2). It is these four B Format signals, which are subsequently manipulated to provide, in my opinion, the most flexible stereo (or mono) microphone around, or even (if you must!) Ambisonics or Periphony. This review, however, only intends to cover the stereo microphone usage.



The B Format Signals

The B Format signals are simply an omni and three figure of eights, given the identifying letters W, X, Y, and Z. W !s the omni, but far more of a true omni without the directionality at HF exhibited by other omnis. X is a figure of eight front to back, with Y a figure of eight from side to side. Z is the third figure of eight orientated in the vertical plane, up and down.

As mentioned earlier, it is these B Format signals which are manipulated by the numerous knobs and buttons on the control unit. This allows a wide variation in the way the SFM sees the world and relays it to your recording. The polar patterns can be altered from omni (where it is in fact a mono mic) through various cardioids, to hypercardioid and figure of eight.

Actually there is nothing new under the sun many years ago there was an STC cardioid microphone which consisted of two transducers, one an omni and the other a figure of eight. These were wired via transformers such that the combination of the omni and the two lobes of the figure of eight (180 degree phase inverted relative to one another) produced a directional microphone with a heart shaped pickup pattern. Mimicking this simple early example, we find in the SFM that it is the W and X signals which are electronically matrixed to give the cardioid polar pattern! And so, in a more complicated way, for the other patterns and for stereo.

The angle, and thus the stereo width, can be varied from O degrees (where it is also a mono microphone, but with whatever polar pattern you selected earlier) through 90 to 180 degrees. As with conventional mics, when working in figure-of-eight mode, 90 degrees should be considered the maximum mutual angle that can be achieved without running into excessive out of phase pick-up. The more cardioid you make the polar pattern, the wider you can take the angle (if that is judged as what you want from what you hear on your monitoring) without getting excessive out of phase components in the signal. Curiously, very often ended up with hypercardioids at 120 degrees in my extensive usage of earlier SFM models. The SFM control unit uses varying amounts of the Y signal to determine the width, just as one does with a Mid & Side microphone rig-nothing new under the Sun!

Suppose the mic is not pointing in exactly the right director? A continuously variable Azimuth control, in effect, rotates the mic to put what you want in the centre of the natural soundstage, bang in the middle of the reproduced soundstage from your loudspeakers. Here it is the B Format X and Y signals, which are matrixed to get the desired result.

The mic can also be 'virtually' tilted up or down 45 degrees. This is where the Z signal is used in conjunction with X. I have always found this to be most effective when working with crossed figure of eights as the selected polar patterns in fact, at one concert recording, this enabled me to properly balance the soprano soloist against the orchestral forces by just tilting the mic downwards for her verses.

There is a zoom in and zoom out control, called Dominance in the user manual, but not labelled that way on the MkV control unit. This has always proved to be a most useful feature of the SFM system, although there are some side effects you should be aware of.

Forward dominance effectively moves the mic forward from where it is. The subjective effect is to 'dry out' the sound, just as a real move forward would in fact do. Actually moving the mic forward would widen the stereo picture, but with forward dominance, the stereo width does the opposite by narrowing a little. There is a rise in signal level from the centre stage you are zooming towards, and I find that a good way to enhance the effect of the drying out of the sound is to separately take the overall signal gain down a few dB as you zoom forward. I was hoping the MkV control unit would have incorporated this little twist as it subjectively enhances the controls effectiveness. The opposite is true for rear dominance, where raising the level would subjectively enhance the effect. Just a thought!

The potential for useful manipulation of the B Format signals does not stop there. Suppose you have slung the mic and then find it is upside down? A switch labelled Invert simply inverts the phase of the Y signal and the logical relationship of the controls on the front of the control unit and what you expect to happen is restored. Without that facility, it would be like driving a car with the pedals in reverse order.

New to the MkV version is the ability to end fire the mic. This is an adoption of the same feature found on the SFM derivative, the ST250 (Audio Media, December 1991). This will be achieved by simply transposing the X and Z signals of the B Format.

There is yet more to the overall B Format use than this. Each of the separate B Format signals can be separately recorded on a four (or more) channel recorder (preferably digital the Nagra D, Alesis and Fostex ADATs, and Tascam DA-88 spring to mind). Then you are able to process to stereo on playback at your leisure, still able to utilise all the pickup pattern manipulation facilities described. The on-site recordings to digital tape will not have been affected by any experimental manipulations you felt you wanted to carry out during the sessions! The eight B Format in and out XLR 3s mentioned earlier allow for this facility, coupled with operating the Tape button on the front panel.

Control Unit In Use

In my field, I would be either connecting the SFM Control Unit's stereo output straight to the line inputs of a DAT recorder, or if the session needed additional mic pairs for balance reasons, to a stereo line input of my usual Classical Mixer. It is essential that whatever it is connected to is able to handle the nominal OdBm signal levels, with peaks possibly going 1 5-20dBs higher. Alternatively, you may be feeding a digital multitrack with the line level B Format outputs. Either way, an alignment tone is provided on the Control Unit. If working from the unit's stereo outputs, I would advise that you take the trouble to 'double mono' the tone by putting the polar pattern control to omni, although you must be sure to remember to it set back to whatever stereo pattern you intended before recording you won t be the first to have inadvertently started recording in mono! It would have been nice if there had been some way that this could have been avoided with the MkV unit The B Format tone feeds are Coded, for easy identification— the W signal being continuous, with the others being interrupted at different rates This helps to ensure that each signal arrives at its proper input when setting up for playback processing.

Now to the question of where to set the tone on the digital level scale. I go for a setting between minus 10dB and minus 15dB the latter especially if the recording system has hf pre-emphasis. The signal peaks will move sensibly beyond this nominal level and digital overload will be avoided. The SFM headroom ceiling is very safely beyond this point. The tone level from the W element of the B Format output is deliberately -3dB relative to the X, Y. Z and L & R outputs

There is a four strip LED display on the SFM Control Unit. These are now in the order W. X, Y. Z. whereas in the past, on the MklV unit, it was X, W. Y. Z. At the centre point of the scale, the colours change from green to red, with 20dB of indication either side, giving 1 OdB more overall range than the MklV version. It is certainly arguable that the first 1 OdB above zero should be, say, yellow, with red reserved for the last part, for as it stands, one is working into the red all the time without it being of any real significance The four strips, of course, show the coding of any B Format tone playback.

The next aspect to consider would be the Main Gain and Fine Gain controls The latter has a detent at its zero point and is intended to be used as near to that point as possible A four ganged pot is employed, accurately controlling the W. X, Y. and Z levels. Overall, it can give a lOdB to +lOdB range, but is said to be calibrated only over the range of the scaling which Is -4 to +2dB. The Main Gain control to its left sets the headroom for the system and offers a 30dB range in three steps. The old MklV unit had an extra 1 OdB of sensitivity. This was not really needed, but it did have 5dB steps nonetheless! So the object is to have the Fine Gain at least in its calibrated area, with the Main Gain set so that peaks are contained. In my field, the 30dB setting Is most likely, but if one was miking a drum kit, there is a further 30 to 40dB of attenuation available.

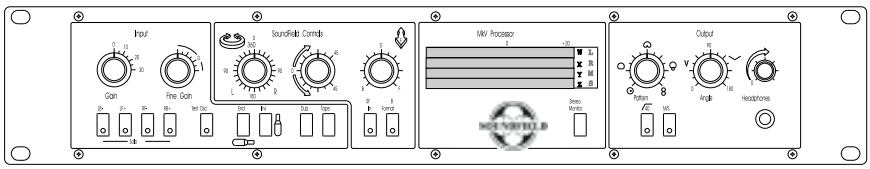
When assessing if all the capsules have a similar output, bear in mind which way they are pointing from inside the mic head. They are all, incidently, semi-cardioid. There is an interesting large print warning in the user guide advising against actually recording with any of the capsules soloed! Could this be as a result of reported misunderstandings of the SFM system, with users thinking that switching off one or more capsules was an intended way of operating the system, despite flashing LED indicators?

To put the SoundField controls (Azimuth, Tilt, and Dominance) into the stereo mic feed, the SF IN button needs to be pressed. Beside it is a button labelled B Format, which puts the SoundField controls into the B Format output feeds. On the old MklV, it was called the REC button. TAPE and DUB are two more buttons to get to know.

The unique tetrahedral capsule array assembly

SOUNDFIELD MKV

The former is an 'off **tape' monitoring** button when working to and from a B Format recorder. It substitutes the tape returns for :he Mic signals for check purposes Purposes DUB is for use after recording, and when you want to replay the B Format via the Fine Gain control and, if necessary, the SoundField controls plus Polar Patterns, Angle etc



The new MKV control unit.

Theory Into Practice

There is no doubt that the SFM system is a natural sounding microphone. Now this presupposes that whatever field of recording you are in, you have the monitoring conditions to recognize this. This will involve both the speakers and the playback room. This latter aspect is, I feel, of greater importance than is usually realised. Colourations in either the speakers or room, or the reactions of either one to the other, could actually mask what a high quality mic system is trying to convey. That apart, I will try and indicate what an SFM is capable of bringing to your recordings.

Obviously in my main field of classical music recording, it must be considered a fine choice for the main stereo mic or even the only mic if a decent musical and venue balance can be obtained on a single stereo mic. In my view, pragmatic musical balance must take second place to any pedantic thoughts that, as you only have one pair of ears then only one mic should be used! Even if additional pairs are deployed, say on the woodwind section, or on a choir, or for soloists near the conductor, it will still be the main mic which will determine the overall quality and the stereo layout.

Apart from the above aspects, and the flexibility of operation covered earlier, for me, perhaps the most coveted asset of the SFM system is the superb stereo imaging and its depth perspectives, given the right speaker/listening room standards. It is well known that spaced omnis can give poor stereo imaging, with wandering localisation of sounds, although other aspects of their performance can be engaging. Crossed directional mics too can be poor, especially as centre stage sounds are off-axis to both mic the very area where their response is most likely to be uneven. A narrow soundstage will be produced by this setup, and overcoming it by spacing the mics does nothing for imaging accuracy.

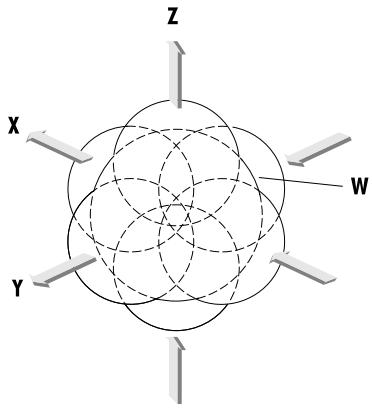
In theory, it is the coincidence or physical closeness of the basic pair of mics involved in stereo working, which determines the accuracy of the imaging. In practice, this is borne out by the SFM system. Although its capsules are relatively close together in the mic head, it is with the conversion to B Format that real coincidence is created with the claimed specification that they are coincident up to 10kHz easily confirmed! Set it up without the Soundfield controls switched in, and with figure of eights at 180 degrees selected. Whilst listening, switch the monitoring into mono and the signal will vanish (except for a little whisper at Hf if present in the signal) just as theory dictates, due, of course, to the superimposed patterns being mutually phase inverted. Try that with conventional figure of eights!

So, with an SFM set up as a stereo pair, you have this virtue of accuracy of imaging in the reproduced soundstage. I personally think that such a projection assists in following the various musical lines and aids the portrayal and judgment of musical balance.

Outside my classical music field, I know that the SFM has surprised many engineers and producers. In the user guide, some ideas are offered in brief paragraphs covering lead and backing vocals, drum miking piano, and 'ambience'. The latter is, I suppose, referring to my area of activity. I can see from the other suggestions that the target market has now become significantly wider.

Some System Tests

I always enjoy setting up all sorts of parallel systems and trying to make sense of any differences noticed, along the way getting some idea of one system's noise floor, its frequency characteristics, and anything else. I did some evaluation of the noise performance of this new MkV SFM versus



The B-Format signals : Z,X and Y are figure-of-eights whilst W is the omnidirectional components

the older MklV, and against a mono B&K 4006 as reference. The latter via a Classical Mixing desk of the sort I normally use.

The two SFM systems were set up via stereo line inputs and the B&K via a phantom powered mic input. Interestingly, the two SFMs had absolutely identical signal levels from their on-board oscillators, and I mean identical, even though they were manufactured at least seven years apart in different factories! Working the SFMs as mono omnis to match the B&K's pattern, and with speech at a standard distance from each mic, the feeds were trimmed to get the same levels from all three systems. Then, with just system noise, the three we. compared for the nature of the noise and the relative They were to all intents identical this is very pleasing for there are of necessity, many ICs in the SFM's circuitry and they do not seem to affect the noise performance, which will indeed be set by capsule output and immediate signal processing.

Very encouraging also, and not just to my ears, but also to a producer colleague, was the fact that the earlier spoken tests had very similar sound quality. This prompted me to try the different types of front grills available for the B&K and also the ball attachment and the nose cone. All apparently areas of varying affect on HF performance and directivity.

I don't think it invalidates the evaluation system, but comparisons with the grill changes from silver to black were not that noticeable The difference with the addition of the ball on the 4006 was similarly very small for on-axis sounds. With the B&K 'nose coned,' the initial change in level nearly put me off the scent, but when reset, it didn't really show any great difference either, which augers well for the basic omni performance of the SFM. What you could not detect was any Hf directionality around the SFM's mic head. The B&K, of course, as any stick omni would, did have less HF from behind as would be expected (except with its nose cone fitted!).

Handling and possible stand borne noise Is of a different character than with the MklV The supplied shock mount is effective as far as stand borne vibrations are concerned, but it pays to decouple the cable too, by looping it from the mic to the boom and taping it in place. However, the type of cable supplied in the review kit shows good immunity to the transmission of vibrations— I have known much worse.

MklV To MkV Changes

There are some more differences of minor detail between the earlier model and the MkV, aside from those touched on in the course of this review. Very useful is the much higher output available from the headphone socket, a healthy 12dB greater and now fine for driving headphones like the Sennheiser HD540s, which need these sorts of levels. There is now a high-pass filter switch near the polar pattern knob. blended to reduce any rumble or wind noise, it attenuates below 40Hz at 1 18dB per octave on signals feeding the L and R output sockets. The L and R outputs and the B Format sends and returns are now balanced feeds, but using the outputs into an unbalanced mixer input also created no problems.

The four B Format LED signal level indicators can be switched from their usual setup to show the L & R signal levels as the top pair and Mid & Side levels as the bottom pair. The latter are intended to be useful when you extract Mid & Side from the unit. The intention is that you do this by operating the MS button near the polar pattern knob. M&S comes up in the corner of the LED

display to show that you have replaced the normal L & R outputs with what should be a usual Mid and Side signal.

I first thought this would be a straightforward variable polar pattern Mid signal on the left feed and a fixed level figure of eight on the right feed. I assume the purpose of this is to allow external decoding to L & R in whatever way us M&S operators to do it. For instance in Film and TV sound, the M and S are often kept separate to tape and only decoded initially for local monitoring. In my case, I usually use several M&S stereo pairs and decode each pair in a custom mixer prior to normal mixing to the recorder.

Back to the MkV's Mid & Side output. As mentioned earlier, what I would want is a variable polar pattern mid and a fixed side figure of eight. What happens with the MkV's M & S outputs can really only be described as curious! The level of the Side output is indeed altered by the Angle Control (at 180 degrees it will be of equal level to the Mid), which is fine as I could leave it at 180 degrees, but it is more complicated and confusing. Vary the polar pattern of the Mid, however, and the level of the Side alters, and disappears when you get to omni. Seems like twisted logic to me, and there is no mention of it in the current user guide!

I solved it. Simply use the B Format Y signal as the Side fixed level and permanently figure of eight. The Mid is then a fantastic fully variable polar pattern feed with end fire, tilt, and most usefully, dominance should you want it. It appears you can even use the Azimuth control, if you put the Soundfield controls into the stereo outputs and into the B Format, at the same time!

One Session And Only One Conclusion

Having been very active with SoundField Microphones over many years, it is perhaps not too disappointing to report that during the review period (over Christmas!), there was only one job to take it out on. The Royal Philharmonic Orchestra were in Watford Town Hall's very fine acoustic with John Denman as soloist (on a 2 foot box in front of the conductor) performing some Clarinet Concertos by Louis Spohr. With two days of sessions to go, I set up the first day in my current manner with a main pair above the conductor's head, two spaced omnis over the extreme left and right of the strings, and a pair on the woodwind behind the soloist. Clarinet versus orchestral versus hall balance was easily managed on the main pair, the spaced string mics being brought up enough to be just noticeable without disturbing the imaging from the main mic. The woodwind were brought into focus and perspective with their dedicated pair. All very conventional in an acoustic which simply allows that to happen.

For the second day, I rigged the SFM MkV just above and behind the other main mic, and the 40 metres of cable supplied in the review kit was just enough to get back to the control room. During some welcome rehearsal sequences, I was able to audition the additional mic in place of the Sennheiser MKH80/30 main pair from the previous day. I must say it was surprisingly easy to mimic the sound we had been getting. Of course, a great deal of variety was on hand if it had been needed but ending up with end fire, hypercardioids at 120 degrees gave similar perspectives to the other rig, and the strings and clarinet sounded just as excellent as we had got used to up to that point.

I knew it would be the case as the SFM system can undoubtedly produce the goods and hold its own against any competitor in the elite Natural sounding mic' field. The CD in question has in fact one edited sequence recorded via the 'interloper' as I failed to switch back after a sneak listen! That will teach me a lesson not to mess about on sessions, but no-one will know when they hear the CD.

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