Schoeps SuperCMIT

Rifle mics have for a long time been a mainstay of a recordist's arsenal as have the audio artefacts that come with them. PATRICK MORVLYTH reports on a 'directionalised' mic that takes a unique approach to solving the problem.

A super-directional microphone is the fictional prop for every film or TV spook series. Insignificantly small, it is able to pick up conversations from the far side of a motorway with perfect fidelity and no unwanted ambient sound. But, as every recordist knows, it is a fiction.

Directional microphones are all based on the principle of the pressure-gradient microphone: a transducer that has both sides of its diaphragm open to sound waves — a two port design. These are inherently bi-directional and have a native fig-8 pattern. To give them something approaching unidirectionality they need to be modified (at least in conceptual terms) by inserting a phase delay in the rear port. This makes the microphone preferentially sensitive to forward rather than rearward sounds due to cancellation effects.

By altering the degree of cancellation any of the cardioid variants can be produced, but the essential problem is that cancellation. Phase, frequency and wavelength are all interrelated so it is fundamentally impossible to maintain precise cancellation across the entire frequency band.

This problem only increases with rifle microphones, which use an interference tube to improve forward directionality. This device is very effective for mid to high frequencies but classically introduces dreadful 'star-fish' lobes into the polar pattern. Coupled with the hypercardioid low-frequency pattern of the microphone it is obvious that the polar response of these mics is all over the place when plotted against frequency, and the result is marked colouration. Off-axis sounds, including the reverberant on-axis audio, will be perceived very differently depending upon the precise angle of incidence.

Microphone manufacturers have some neat tricks up their sleeves and when Schoeps brought out its CMIT5U four years ago the only obvious colouration was the startling blue of its paintwork. If you panned the microphone off to the side a sound source simply got quieter rather than becoming honky or nasal. In directivity terms it was also good, managing something approaching 20dB preference for forward sounds from 2kHz upwards (where the interference tube starts to operates) but, being based on a conventional hypercardioid capsule, this dropped to only 8dB at 250Hz.

Given that these problems are governed by the physical laws of acoustic waves how can you get around them? The answer, for Schoeps, has been to ally digital processing with the essentially analogue principles of a normal microphone. In the barrel of the SuperCMIT (UK£2640 + VAT), just behind the interference tube is a second (cardioid) capsule, which faces backwards. This picks up the ambient sound while largely ignoring the forward, wanted audio. The output of both capsules is digitised and the ambient signal can then be subtracted from the forward one. Cancellation once again, but this time it is in the digital domain where the relationship between phase, wavelength and frequency is much more elastic. The actual algorithms are provided by a Swiss company, Illusonic, and the processing is done by a DSP housed in the microphone body.

To look at, the microphone is like a slightly stretched version of the original CMIT5U — the same signature blue, three neatly recessed buttons with six discreet LEDs to show the settings. The HF lift (to counteract the effects of a furry windscreen) and the steep cut 18dB/octave 80Hz filter for handling and windnoise are unchanged, but the third button now operates a choice of directionality. Preset 1 gives a Directivity Index of 11dB while Preset 2 gives 15dB, with the caveat that a few processing artefacts might be heard. By comparison a conventional rifle microphone only manages a DI of about 7dB (a cardioid is 5dB).

As a digital microphone the Super CMIT uses the AES42 interface format — an XLR3, but not as most recordists know it. The microphone has to be supplied with digital phantom power (10V 170mA) and see a digital input that can lock to its 48kHz signal. For the review I used Schoeps' PSD 2U powering adapter and Marian Marc 2 audio card in a PC, plus a switchable input amplifier to provide headphone monitoring. AES42 provides two signal paths so Channel 1 is the processed signal and Channel 2 is the raw output — the basic CMIT5U. This allows a useful A/B illustration of how effective this 'directionalised' microphone is.

Very impressive is the only possible comment. Off-axis sounds just disappear and do so at all frequencies, not simply the mids and highs. At 250Hz the rear sensitivity is –14dB, or –25dB depending upon the preset, which is far beyond what even the longest rifle microphone (with all its self-evident colouration) can manage.

The primary impression, visually and sonically, is simply one of great cleanliness. Schoeps has always been an understated company and the only ostentatious quality of the microphone is its paintwork. A direct comparison of the raw and processed channels reveals a change in the background noise — partly the 3dB drop in the processed signal noise floor and partly the difference in ambience — and a marked focussing of the 'wanted' audio.

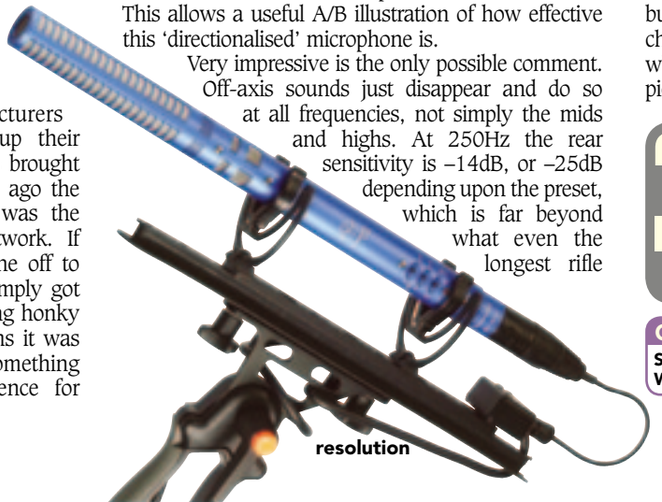
With Preset 1 I could not discover any artefacts at all while listening to speech and music in a reverberant space. After some guidance from Schoeps I was able to discover a very mild one with Preset 2 — distant direct sounds may be confused with ambient ones, which the software is trying to cancel. The result was a reduction in low frequencies — mid and HF is not processed — which only careful A/Bing demonstrated.

The other noticeable effect is that the space around you tends to disappear — not dissimilar to the effect of noise-cancelling headphones — and this may feel a little strange *(I noticed this also. Ed)*, though it is an inevitable by-product of the directivity that you would want this microphone for.

The dynamic range window of the microphone is 125dB Max SPL (0dBfs) and a noise floor of 13dBA when processing is being used. That means that the output signal of a typical sound source can appear very low when monitored on headphones. Indeed you might need up to 50dB of monitoring gain to listen comfortably to normal output. This does bring with it some interesting problems.

Rifle microphones are widely used for location recording but very few trolley and electric handbag mixers have the option of an AES42 input. Mixer/recorders such as the Sound Devices 788T can be used but operators will need to think about the problems of adding digital gain, and thus limiting dynamic range, if they want to mix the Super CMIT with analogue microphones — or of taking the simpler approach and recording it with no control at all as 24-bit iso track for mixing later.

These are, of course, general problems that beset the integration of digital microphones into our current recording world rather than anything specific to the SuperCMIT, and they are likely to get solved because the benefits of using this type of technology are too great to ignore. Among those benefits are that the behaviour of this sort of microphone is not rigidly fixed in hardware but can be fine-tuned and improved by firmware changes. That is a radically different way of achieving what most recordists have yearned for since they first picked up a rifle microphone. ■



PROS Superb full frequency directivity; 24-bit digital avoids the need for setting any levels.

CONS AES42 connectivity limits the choice of mixers and recorders; not a direct substitute for plain vanilla analogue mics.

Contact

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