

5.1 The Easy Way

Sennheiser's Esfera microphone system creates perfect broadcast surround sound from just two channels

A white paper from Sennheiser Electronic

The Sennheiser Esfera microphone provides 5.1 surround sound from just two channels, making complicated surround microphone installations a thing of the past. The system consists of a high-quality stereo microphone, and uses Sennheiser's RF condenser technology. An associated 19 in rack-mount processing unit converts the stereo signal into a complete 5.1 signal – anywhere in the production workflow, whether in real time or during post production. The compact size of the microphone unit and the versatile connectivity of the processing unit ensure that Esfera can easily be integrated into existing workflows.

Sennheiser anticipate that sports broadcasts will find immediate application for Esfera. These broadcasts are almost entirely produced in 5.1 and will benefit from the rapid microphone installation, the user-friendliness of the processing unit, and the freedom in workflow design that the system offers.



Sennheiser's Esfera microphone system creates a full 5.1 surround sound from a stereo signal.

Just two channels do the trick: workflow examples of fixed installations and cameras

In fixed installations, the Esfera microphone is positioned alongside the pitch or underneath the stadium roof. The audio signal is fed into the stadium's network via two standard microphone cables, then converted into an AES3 signal and routed to the OB van, where the host broadcaster has a choice of two options:

- The two audio channels can be converted into a 5.1 signal onsite – with the settings defined by the A1 of the host broadcaster – and transmitted to the local broadcasters.
- Or, alternatively, the stereo audio signal is directly transmitted to the local broadcasters who do the conversion into 5.1 with their own preferred settings.

Esfera only uses two of the four audio channels of broadcast cameras, allowing the crew to also work with other microphones – for example, a clip and a boom microphone. During the entire production process from the recording to editing and post-production, the audio signal is in sync with the video signal and will only be decoded into 5.1 during the last step of production.

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Esfera is also the first system that allows the recording of 5.1 surround sound from a wireless camera. As the system only requires two channels, the audio can be transmitted together with the image and later be converted into 5.1, for example in the OB truck.



The Esfera microphone unit consists of two radio-frequency condenser microphones.

Esfera – the SPM 8000 stereo microphone

At the heart of Esfera’s SPM 8000 stereo microphone are two radio-frequency condenser capsules. This microphone pair offers all the advantages that Sennheiser RF condenser microphones are renowned for: natural, detailed sound, transparency, high resistance to adverse climatic conditions, and ruggedness.

The stereo microphone arrangement is optimized for surround decoding by the SPB 8000 processing unit. The two matched cardioid microphones pick up a field covering 270 degrees (see figure 1).

SPB 8000 generates the surround signal by forming a highly directive beam for each of the five channels. These highly directive beams are well-behaved like high-quality microphones, featuring well-defined free-field response, diffuse field response, and directivity pattern.

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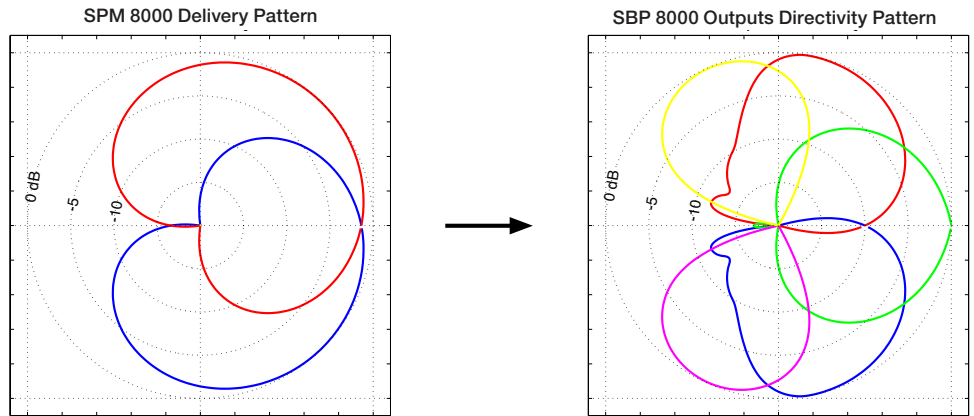


Figure 1. The crossed pair of cardioid directivity patterns are processed to five directive beams.



The parameters of the 5.1 conversion can be modified via an Ethernet interface.

The surround directivity pattern and diffuse field gain (i.e. the ratio between direct sound/ambience) can be adjusted via a web interface and thus be tailored to the specific situation and needs (Esfera SBP 8000 utilizes Illusonic’s patented beamforming technology).

The microphones feature an extremely low inherent self-noise. Due to the symmetrical transducer design, the microphones have very low distortion figures. They are inherently fully floating and balanced and do not require an additional balancing circuit or transformer to protect them from external interfering signals.



Esfera microphone unit with windshield basket.jpg: The stereo microphone comes complete with a windshield basket and hairy cover, a suspension/pistol grip and a stereo cable (XLR-5 to 2 x XLR-3).

The microphone system can also be used on its own wherever a high-quality stereo microphone is required. The SPM 8000 is supplied complete with a windshield basket and ‘hairy’ cover, a suspension/pistol grip and a stereo cable (XLR-5 to 2 x XLR-3).

Esfera – the SBP 8000 processing unit

The Esfera processing unit uses a special algorithm to generate a full 5.1 surround signal with sampling rates of up to 96 kHz from the microphones' stereo signal. The processor has an integrated compressor.

The design of the processing unit is clearly laid out with four directly selectable presets. If needed, these presets can be modified via an Ethernet interface. The processor software enables the user to adjust the gain of the individual channels, modify the front and surround focus, determine the surround delay, adjust several filters with their cut-off frequencies and set the compression, the limiter and the treble boost.

To ensure the utmost in flexibility for the signal flow, the input side of the SBP 8000 is fitted with two analog XLR-3 sockets with P48 phantom powering and two digital inputs for an AES3 signal. On the output side, the unit has six digital outputs (left, right, centre, LFE, surround left, surround right) for three AES3 signals.

Sennheiser first introduced the Esfera surround microphone system at IBC 2013 and has been shipping since March 2014.



The Esfera processing unit generates a full 5.1 surround from the stereo microphone signal.

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