

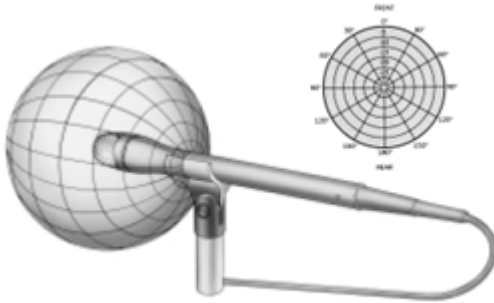
POLAR PATTERNS EXPLAINED

Directionality - The sensitivity to sound relative to the direction or angle of arrival at the microphone. Directionality is usually plotted on a graph referred to as a polar pattern.

The polar pattern shows the variation in sensitivity 360 degrees around the microphone, assuming that the microphone is in the center and 0 degrees represents the front or on-axis direction of the microphone.

There are a number of different directional patterns designed into microphones. The three basic patterns are omnidirectional, unidirectional, and bidirectional.

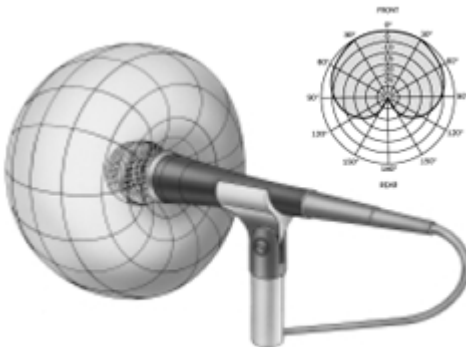
Omnidirectional Microphones



Omnidirectional

The omnidirectional microphone has equal response at all angles. Its coverage or pickup angle is a full 360 degrees. This type of microphone can be used if more room ambience is desired. For example, when using an omni, the balance of direct and ambient sound depends on the distance of the microphone from the instrument, and can be adjusted to the desired effect.

Unidirectional Microphones



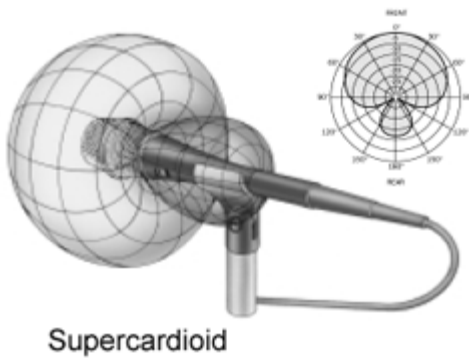
Cardioid (Unidirectional)

The unidirectional microphone is most sensitive to sound arriving from one particular direction and is less sensitive at other directions. The most common type is a cardioid (heart-shaped) response. This has full sensitivity at 0 degrees (on-axis) and is least sensitive at 180 degrees (off-axis).

Unidirectional microphones are used to isolate the desired on-axis sound from unwanted off-axis sound. In addition, the cardioid mic picks up only about one-third as much ambient sound as an omni.

For example, the use of a cardioid microphone for a guitar amplifier, which is in the same room as the drum set, is one way to reduce the bleedthrough of drums on to the recorded guitar track. The mic is aimed toward the amplifier and away from the drums. If the undesired sound source is extremely loud (as drums often are), other isolation techniques may be necessary.

Both patterns offer narrower front pickup angles than the cardioid (115 degrees for the supercardioid and 105 degrees for the hypercardioid) and also greater rejection of ambient sound. While the cardioid is least sensitive at the rear (180 degrees off-axis), the least sensitive direction is at 125 degrees for the supercardioid and 110 degrees for the hypercardioid. When placed properly they can provide more focused pickup and less room ambience than the cardioid pattern, but they have less rejection at the rear: -12 dB for the supercardioid and only -6 dB for the hypercardioid.



Bidirectional Microphone

The bidirectional microphone has full response at both 0 degrees (front) and at 180 degrees (back). It has its least response at the sides. The coverage or pickup angle is only about 90 degrees at the front (or the rear). It has the same amount of ambient pickup as the cardioid.

This mic could be used for picking up two sound sources such as two vocalists facing each other. It is also used in certain stereo techniques.

Other directional-related microphone characteristics:

Ambient sound sensitivity - Since unidirectional microphones are less sensitive to off-axis sound than omnidirectional types, they pick up less overall ambient or room sound. Unidirectional mics should be used to control ambient noise pickup to get a cleaner recording.

Distance factor - Since directional microphones have more rejection of off-axis sound than omnidirectional types, they may be used at greater distances from a sound source and still achieve the same balance between the direct sound and background or ambient sound. An omnidirectional microphone will pick up more room (ambient) sound than a unidirectional microphone at the same distance. An omni should be placed closer to the sound source than a unit about half the distance – to pick up the same balance between direct sound and room sound.

Off-axis coloration - A microphone's frequency response may not be uniform at all angles. Typically, high frequencies are most affected, which may result in an unnatural sound for off-axis instruments or room ambience.

Proximity effect - For most unidirectional types, bass response increases as the microphone is moved closer to the sound source. When miking close with unidirectional microphones (less than 1 foot), be aware of proximity effect: it may help to roll off the bass until you obtain a more natural sound.

Understanding and choosing the frequency response and directionality of microphones are selective factors which can improve pickup of desired sound and reduce pickup of unwanted sound. This can greatly assist in achieving both natural sounding recordings and unique sounds for special applications.

