Microphone Pickup Patterns

Each type of mic pickup pattern captures audio in a different way – similar to using different lenses on a camera. Omni, Cardioid and Hyper-Cardioid/Shotgun are more commonly used patterns.

Good source for more info: https://isaacfmp.wordpress.com/2015/03/07/microphone-polar-patterns/

Omnidirectional Mics (Omni Mics)

- Picks up sound equally in all directions.
- **Sounds coming from the rear, the sides, the front and the back are all heard equally** prominent on the soundtrack regardless of which direction they are coming from.
- Best for recording ambience and the general sound of the location without emphasizing any particular person speaking or source of sound.
- *Exception to this rule- Omni Lavalier mics*

Cardioid Mics

- Audio is captured in a heart-shaped pattern. So anything within the range of that pattern is picked up nice and clear, and everything outside of that pattern tends to fall off a little bit.
- Cardioid mics typically have about a 1-5 foot range, so they are often used as handheld mics placed on a podium or used to record instruments.

Hyper-Cardioid Mics / Shotgun Mics

- More commonly referred to as shotgun mics.
- Very tight and focused pickup pattern - similar to Cardioid mics but much more focused and narrow.
- Diminish sound from the sides and the rear while focusing on sounds they are pointed at.
- Great for isolating a subject’s voice from a noisy or crowded environment.
Amplitude & Frequency - two main properties of a regular vibration that affect the way it sounds.

Amplitude is the size of the vibration, and this determines how loud the sound is. We have already seen that larger vibrations make a louder sound.

Amplitude is important when balancing and controlling the loudness of sounds, such as with the volume control on your CD player. It is also the origin of the word amplifier, a device which increases the amplitude of a waveform.

Frequency is the speed of the vibration, and this determines the pitch of the sound. It is only useful or meaningful for musical sounds, where there is a strongly regular waveform.

Frequency is measured as the number of wave cycles that occur in one second. The unit of frequency measurement is Hertz (Hz for short).

A frequency of 1 Hz means one wave cycle per second. A frequency of 10 Hz means ten wave cycles per second, where the cycles are much shorter and closer together.

Understanding sample rate
Sample rate indicates the number of digital snapshots taken of an audio signal each second. This rate determines the frequency range of an audio file. The higher the sample rate, the closer the shape of the digital waveform is to that of the original analog waveform. Low sample rates limit the range of frequencies that can be recorded, which can result in a recording that poorly represents the original sound.
**Two sample rates**

A. Low sample rate that distorts the original sound wave. B. High sample rate that perfectly reproduces the original sound wave.

To reproduce a given frequency, the sample rate must be at least twice that frequency. For example, CDs have a sample rate of 44,100 samples per second, so they can reproduce frequencies up to 22,050 Hz, which is just beyond the limit of human hearing, 20,000 Hz.

Here are the most common sample rates for digital audio:

<table>
<thead>
<tr>
<th>Sample rate</th>
<th>Quality level</th>
<th>Frequency range</th>
</tr>
</thead>
<tbody>
<tr>
<td>11,025 Hz</td>
<td>Poor AM radio (low-end multimedia)</td>
<td>0–5,512 Hz</td>
</tr>
<tr>
<td>22,050 Hz</td>
<td>Near FM radio (high-end multimedia)</td>
<td>0–11,025 Hz</td>
</tr>
<tr>
<td>32,000 Hz</td>
<td>Better than FM radio (standard broadcast rate)</td>
<td>0–16,000 Hz</td>
</tr>
<tr>
<td>44,100 Hz</td>
<td>CD</td>
<td>0–22,050 Hz</td>
</tr>
<tr>
<td>48,000 Hz</td>
<td>Standard DVD</td>
<td>0–24,000 Hz</td>
</tr>
<tr>
<td>96,000 Hz</td>
<td>Blu-ray DVD</td>
<td>0–48,000 Hz</td>
</tr>
</tbody>
</table>
Understanding bit depth

Bit depth determines dynamic range. When a sound wave is sampled, each sample is assigned the amplitude value closest to the original wave’s amplitude. Higher bit depth provides more possible amplitude values, producing greater dynamic range, a lower noise floor, and higher fidelity.

Note:
For the best audio quality, Audition transforms all audio in 32-bit mode and then converts to a specified bit depth when saving files.

<table>
<thead>
<tr>
<th>Bit depth</th>
<th>Quality level</th>
<th>Amplitude values</th>
<th>Dynamic range</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-bit</td>
<td>Telephony</td>
<td>256</td>
<td>48 dB</td>
</tr>
<tr>
<td>16-bit</td>
<td>Audio CD</td>
<td>65,536</td>
<td>96 dB</td>
</tr>
<tr>
<td>24-bit</td>
<td>Audio DVD</td>
<td>16,777,216</td>
<td>144 dB</td>
</tr>
<tr>
<td>32-bit</td>
<td>Best</td>
<td>4,294,967,296</td>
<td>192 dB</td>
</tr>
</tbody>
</table>

Higher bit depths provide greater dynamic range.