

# Recording Acoustic and Classical Guitar class

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## Microphones

A brief history...

In 1827 Sir Charles Wheatstone was the first person to coin the phrase “Microphone” He was instrumental in the development of the first Telegraph in Britain.

1876, Emile Berliner invented the first microphone used as a telephone voice transmitter. Greatly improved the newly invented telephone.

1878, David Edward Hughes invented the Carbon Microphone. ( The telephone receiver you used as a kid- if you’re over forty). This technology was later replaced by dynamic (coil/magnet), ribbon, and condenser mics.

Microphones take air molecules oscillating back and forth and map them to alternating current electrical energy-electrons moving back and forth at a corresponding frequency and amplitude. The diaphragm vibrates in response to air pressure changes and this motion is converted to electrical current with a transducer. Transducers come in three varieties: Dynamic, Condenser and Ribbon.

Condenser Mics : Greater frequency and transient response. The diaphragm is very light and responsive because it’s free floating, it’s not attached to a coil, as in dynamic mics. Higher output, more expensive, generally require power supply (Phantom Power).

Condensers are more fragile than dynamic mics. Small diaphragm (SDM) and large diaphragm (LDM). SDM’s are more “even” sounding with a better reproduction of transients. LDM’s usually give a lower resonate freq, and are less responsive - warmer sounding.

Dynamic Mics : More rugged. Resistant to moisture and other abuse. Don’t require a power supply. Sound quality is not as accurate as condensers. Able to withstand high sound pressure.

Ribbon Mics : similar to condensers in sound, even more fragile

Condenser Mics I own : AT4051a,-Small Diaphragm Cardioid. AKG C414-ULS-Larger Diaphragm. Milab DC-96B. Soundelux U-95\_tube Omnidirectional Polar pattern.

Expensive Condenser Mics : Neumann U87AI,U89I,(large diaphragm),KM184,(Small Diaphragm),Schoeps CMC series, Blue-Dragonfly, Danish Pro Audio 4011

Cheaper Condenser Mics : Rode NT1, MXL 991.

Dynamic Mics I own : Sennheiser MD421, Shure 57, Audio Technica ATM41.

Ribbon Mics: Royer.

## Microphone polar patterns

There are a couple different pickup patterns for microphones. The most common being cardioid, hypercardioid, omnidirectional and bidirectional.

Cardioid ..the most common pickup pattern. Cardioid means “heart-shaped”. A cardioid pattern means pickup to the front of the microphone, and to a lesser extent the sides, with good rejection of sound to the back of the microphone.

Hypercardioid... A hypercardioid microphone (commonly referred to as "hyper") takes the cardioid concept a step further. A hypercardioid microphone records from the front, a lesser extent to the sides, and rejects everything around 120 degrees to the back of the microphone. Hypercardioid microphones work especially well for on-stage vocal applications (to help with monitor feedback) and live recording in far-away or difficult acoustic situations.

Omnidirectional...An omnidirectional microphone picks up sound equally 360 degrees around the microphone capsule. Omnidirectional microphones sound very open and natural, and are best suited for good acoustic environments, or in a recording situation where an open, natural sound is desired. Omnidirectional microphones can make some of the best recordings of acoustic instruments, given a good recording room. Their natural, open sound also makes binaural recording possible, if mounted properly. Omnidirectional microphones are not preferred for live sound, as they tend to pickup ambient noise.

Figure-8 (or "Bidirectional")...A figure-8 (or "bidirectional") microphone picks up sound equally from both sides of the mic's diaphragm. It rejects sound from the sides, as a cardioid pattern would, but picks up sound equally well from the rear as it does the side. Most ribbon microphones are in figure-8 configurations. Ribbon microphones sound fantastic on acoustic instruments, in stereo configurations for live recording of acoustic and jazz groups, and as drum overheads. Due to their sensitivity, ribbon microphones aren't recommended for harsh, high-SPL environments. Figure-8 microphones are commonly used in "mid-side" recording setups.

Hemispherical boundary-layer mics... The evenness and low-end extension of the mic's frequency response depend on the size of the boundary on which the mic resides. Deploy boundary-layer mics either to a wall, a ceiling, or a floor or attach them to a sheet of Plexiglas or other portable flat surface.

## Stereo Mic techniques

There are a couple different ways to position two Microphones in stereo on a guitar.-Two Mics at the same height, one pointing at the 12 the fret, the other

at the bridge. Use the 3 to 1 rule for this technique. The distance between the mics should be at least three times the distance between each mic and the sound source. (not close enough for phasing issues.

- Two Mics positioned exactly at the same place, (probably the 12<sup>th</sup> fret). This is called XY mic-ing. It's important to mention that the mics center axis' are 90 degrees to each other, and usually 45 degrees off axis from the source. Usually place an XY 1-2 feet in front of the sound hole .No phasing issues here. Very natural sound.

Matching pairs of Microphones\_ two mics that have been factory certified to produce virtually identical frequency response. Not all manufacturers sell matched pair Microphones.

Stereo to Mono\_ Folding down to mono from stereo might drastically change the sound if potential phasing problems are not attended to. Even in the 3 to 1 rule there might be some transients on one track that might be out of phase with transients on another track. Fortunately with AM radio's diminishing role as a music medium-mono compatibility is less of an issue. Two mics at the same spot is never an issue because they receive the sound waves exactly at the same time.

EQ\_ Boominess is a common issue on Guitars. Cut 100 hz to 250 hz to minimize. For more air, add 12-16 khz with a high q level.. E.Q. applied to acoustic guitar can be radically different considering the musical situation you're involved with. Mic polar patterns are important here. The tighter the pattern...hypercardioid or cardioid...the more bass "proximity effect". Omni has almost no bass buildup.

Limiting/Compressing\_ (Dynamics) A limiter/Compressor will almost always help you get a better sound

Ratio- The amount of compression applied...

Threshold- at what db level does the compression kick in....

Attack – less or more compression on the initial attack...

Release- less or more compression on the release..

Gain- set this to a level that gives a good healthy signal without clipping...

Pre-amps -Because of the low level signal microphones output, a preamp is always used to boost the signal. All condenser microphones need phantom power (+48 volts) which is usually included in a preamp. All mixing boards have pre-amps built in. As with microphones there are a wide assortment of pre-amps.

Pre-amps I own: Avalon VT 737 Focusrite "Red" 7.

A/D converters- With the introduction of digital/ computer recording Analogue to Digital converters are another link in the chain to getting a great sound.

<http://www.apogeedigital.com> - This company is known for it's outstanding converters.

<http://www.motu.com/> This company is known for it's amazing products at amazing prices.

<http://www.digidesign.com/> Great products.. basically the industry standard.

<http://www.mhsecure.com/v5mm/ULN-8.html> Metric Halo Box

Plug-ins.... Variety of different digital effects processors enabling you to further refine your sound.

Compressors/Dynamics - explained above, in a digital format

There are many different sounding compressors on the market that are meant to color your sound in a variety of ways.

E.Q.- also explained above

Different EQ's also can sound unique from each other

Limiters.. use these to bring the "Loudness" level up on your mixes to compete with the decibel level of commercial recordings..

Reverb- artificial simulation of your instrument in a room or hall.

Convolution reverbs are the most natural sounding. They use sound impulse waves from an actual acoustic space to enhance your track. Try to record your instrument in a completely "dead" environment, (no room sound) to take full advantage of a great reverb plug-in.

Plugins from companies I own and use....

<http://www.waves.com/>

<http://www.izotope.com/>

<http://www.pspaudioware.com/>

<http://www.sonalksis.com/>

<http://www.ikmultimedia.com/Main.html?MainPage.php>

<http://www.tcelectronic.com/powercore.asp>

Playing Techniques - Getting a good sound out of your hands and instrument.

Take off that rattling watch !!!!

Try not to plant your hands on the body....

Find a seat that works for you !!

Beware of over squeaky strings !!

Get used to your sound with headphones on ....

Don't let your click track "bleed" through the headphones into the microphone.