music 174a - fall2021

recording 1 - microphones

week three/four

music 174a - week three - microphone parts

- diaphragm
- XLR connection
- windscreen
- vents
- pad and filter switches
- pattern switches
- end or side address

end or side address?

sennheiser md421 mkii

music 174a - week three - using the mic

- connection
- phantom power
- tube mics
- mic stands - booms
- mic clips - shock mounts
- finding the live end
- mic preamp level

music 174a - week three - mic types

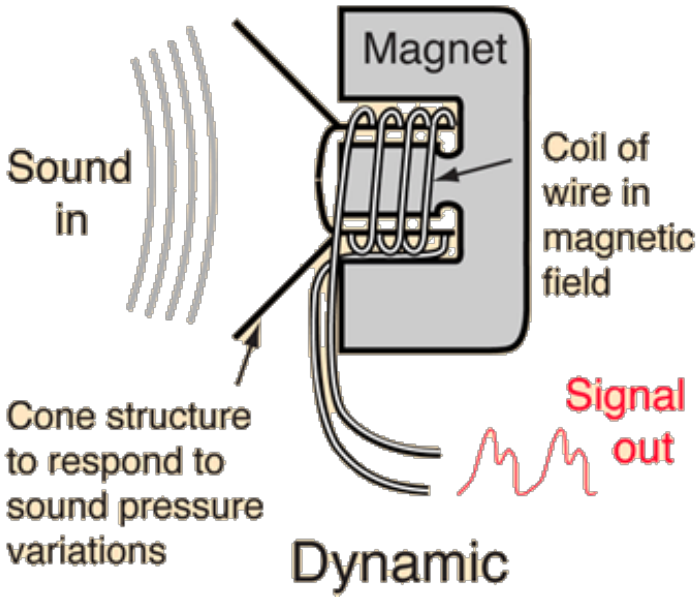
- dynamic - moving coil
- condensor (capacitor)
- electret condensor
- ribbon - dynamic
- piezo - contact
- carbon (carbon button)
- large diaphragm vs. small diaphragm

what to look for in a microphone

- **frequency response** - both evenness across all frequencies and boosts and cuts in specific ranges for particular needs.
- **sensitivity** - how well can it respond to quiet sounds and quick transients.
- **directionality** - how narrow or wide its “focus” is.
- **dynamic range** - loudness before distortion, how quiet before hiss.
- **mechanical and environmental**
- **switchable features** - pattern, pad, bass cut

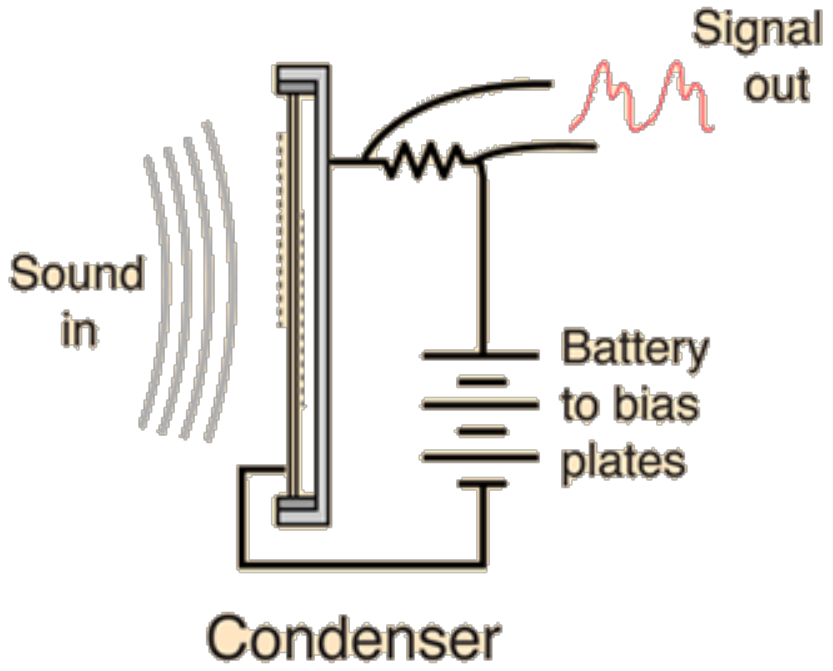
mus174a - moving coil dynamic

- dynamic - generates its own electricity
- coil of wire connected to diaphragm moves past a magnet.
- inexpensive, sturdy, doesn't distort easily. limited high frequencies.
- good for vocals, brass, sax, amps, toms. live sound.
- shure sm57, sm58, sm7. electro-voice 635, re20. sennheiser e906, md421



mus174a - small diaphragm condenser (SDC)

- requires external power for electronics (phantom power)
- charge between diaphragm and back plate varies as diaphragm moves
- can be expensive, full frequency range. distorts easily. sensitive and precise sound.
- good for all but the loudest instruments.
- schoeps cmc6, neumann km184, akg c451, dpa 4011a, shure sm81, earthworks

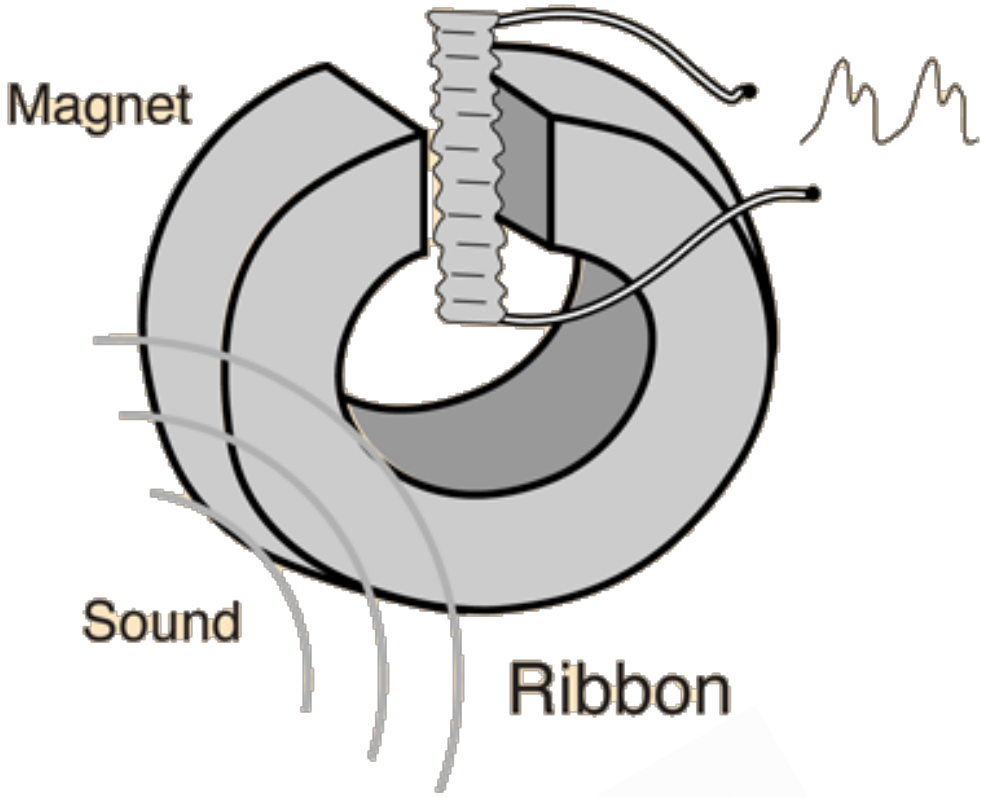


mus174a - large diaphragm condenser (LDC)

- similar to SDC in most ways
- sometimes tube electronics.
- can be expensive, full frequency range. more sensitive, open and usually warmer.
- best for voice, ac. guitar, cello, piano, harp, saxophone
- neumann u87/tlm103/tlm170, mojave ma-200, akg c214/ c414 shure sm27, rode nt1

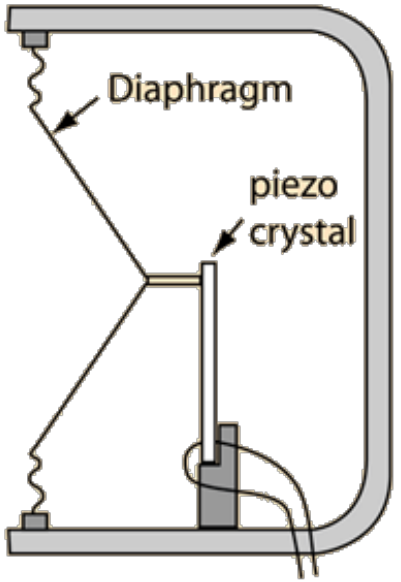
mus174a - ribbon dynamic

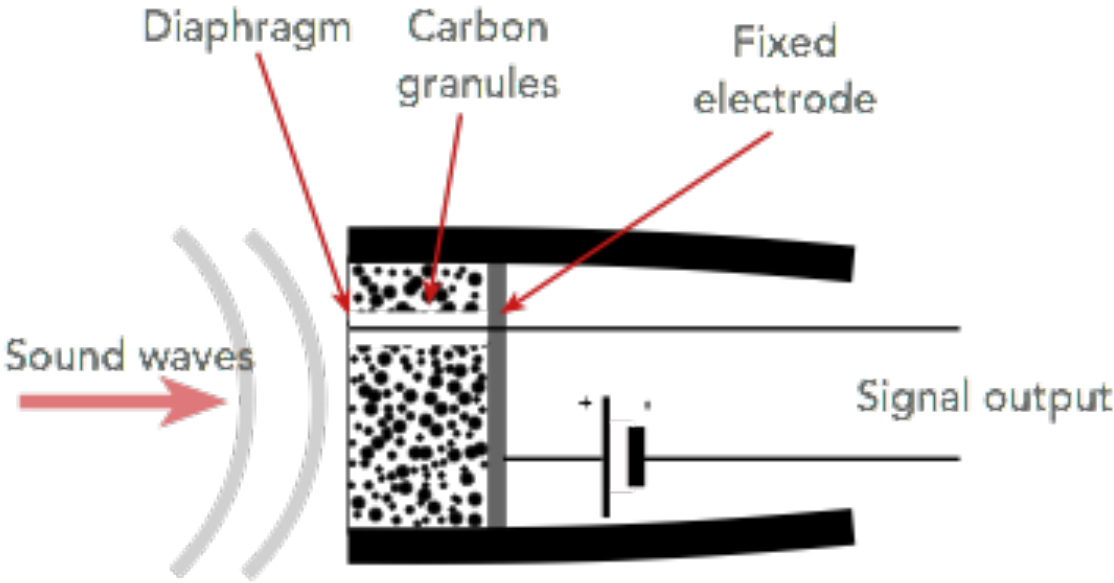
- dynamic - generates its own electricity
- a light ribbon of metal moves past a large magnet inducing a current on the ribbon.
- natural wide frequency response, needs a lot of amplification, often warm sounding
- best to capture sound which needs warmth: trumpet, violin, voice, drum overhead
- royer r121, aea r44cx (rca clone), coles 4038, golden age r1



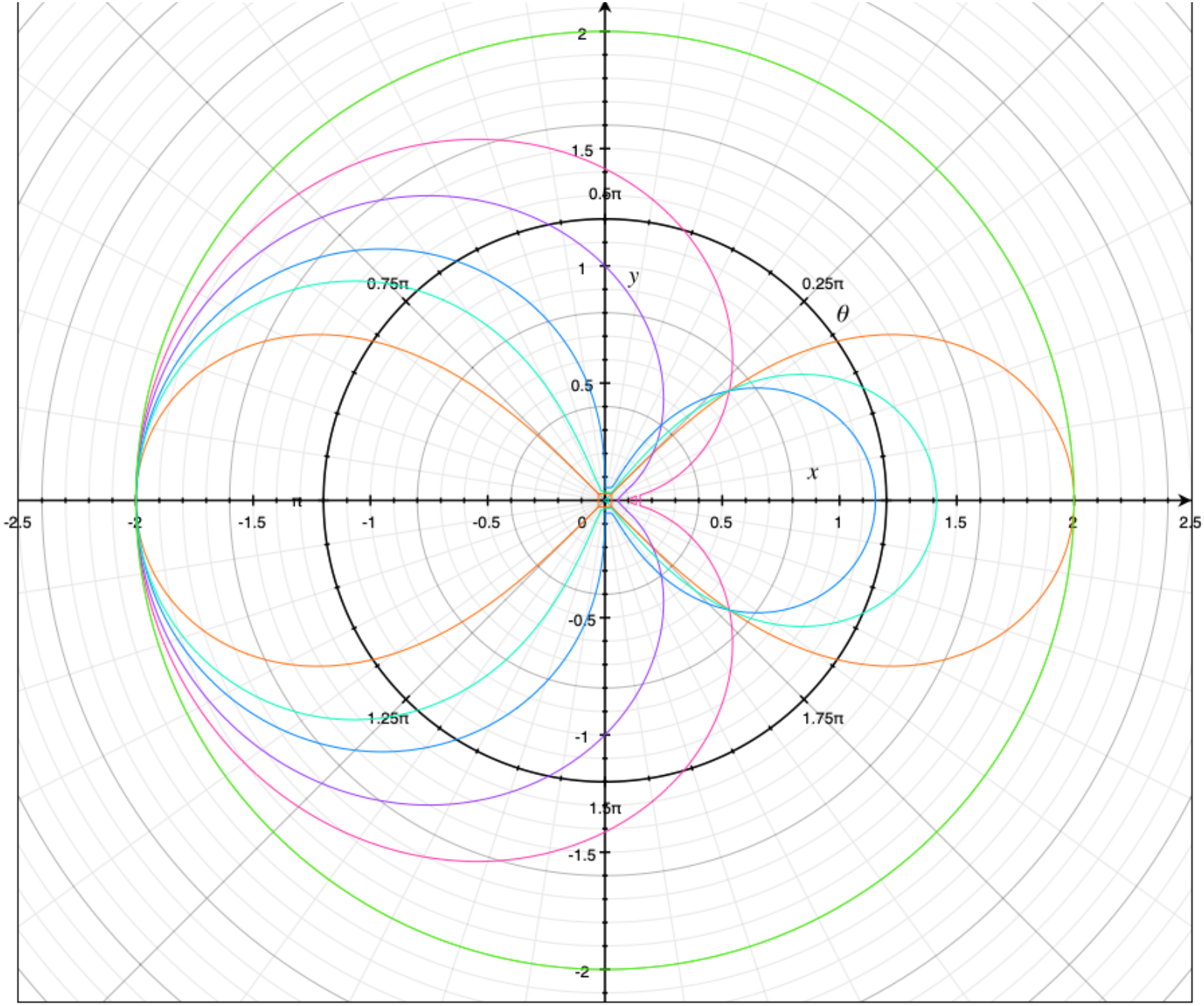
mus174a - contact and carbon

- contact mics work with piezo-electric elements, making electricity from physical motion
- no feedback, limited low & high frequencies. good for stage pickup of instruments.
- carbon mics are one of the earliest mic types, work by measuring conductivity in a capsule of carbon granules (aka “carbon button”).
- limited frequency and volume, distort easily. tinny. good to emulate old telephones, police radio, subway announcements. harmonica & raw vocals.





next - mic patterns & stereo techniques

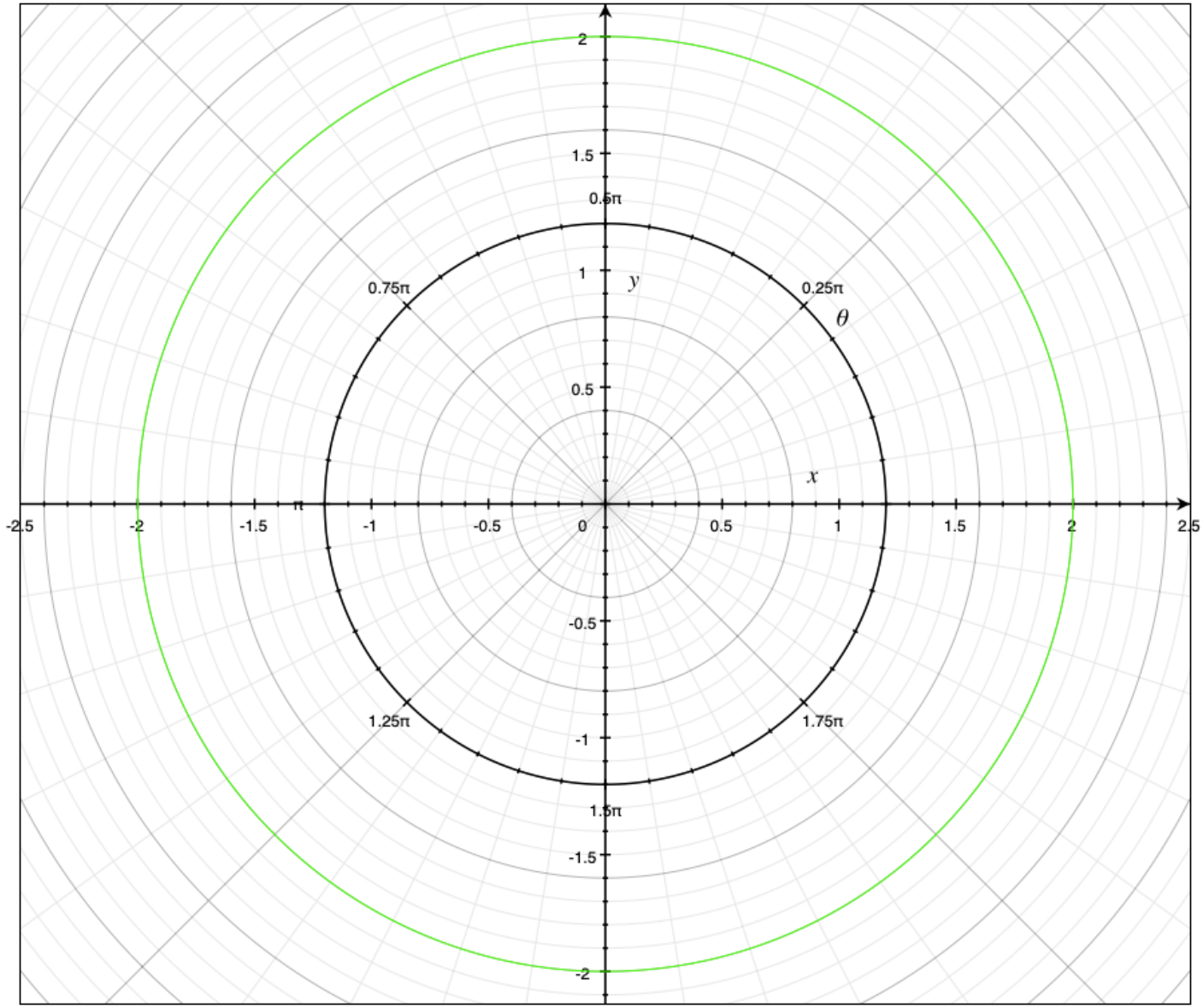


microphone patterns

mus174a - week 4
tuesday

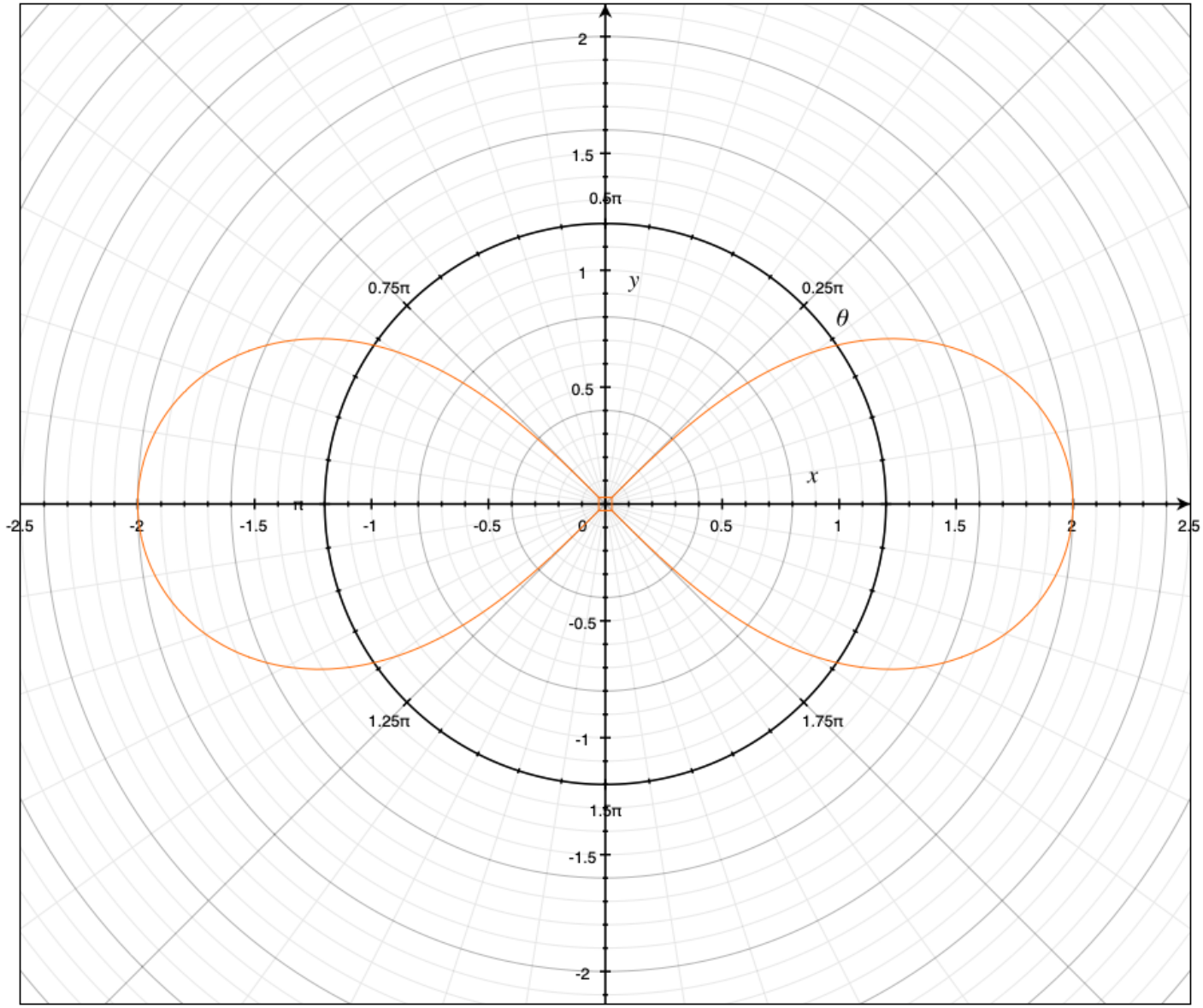
mus174a - omnidirectional microphone

- aka - pressure microphone
- sound from all sides at equal volume
- best natural bass response
- good for natural recording
- separation only by distance



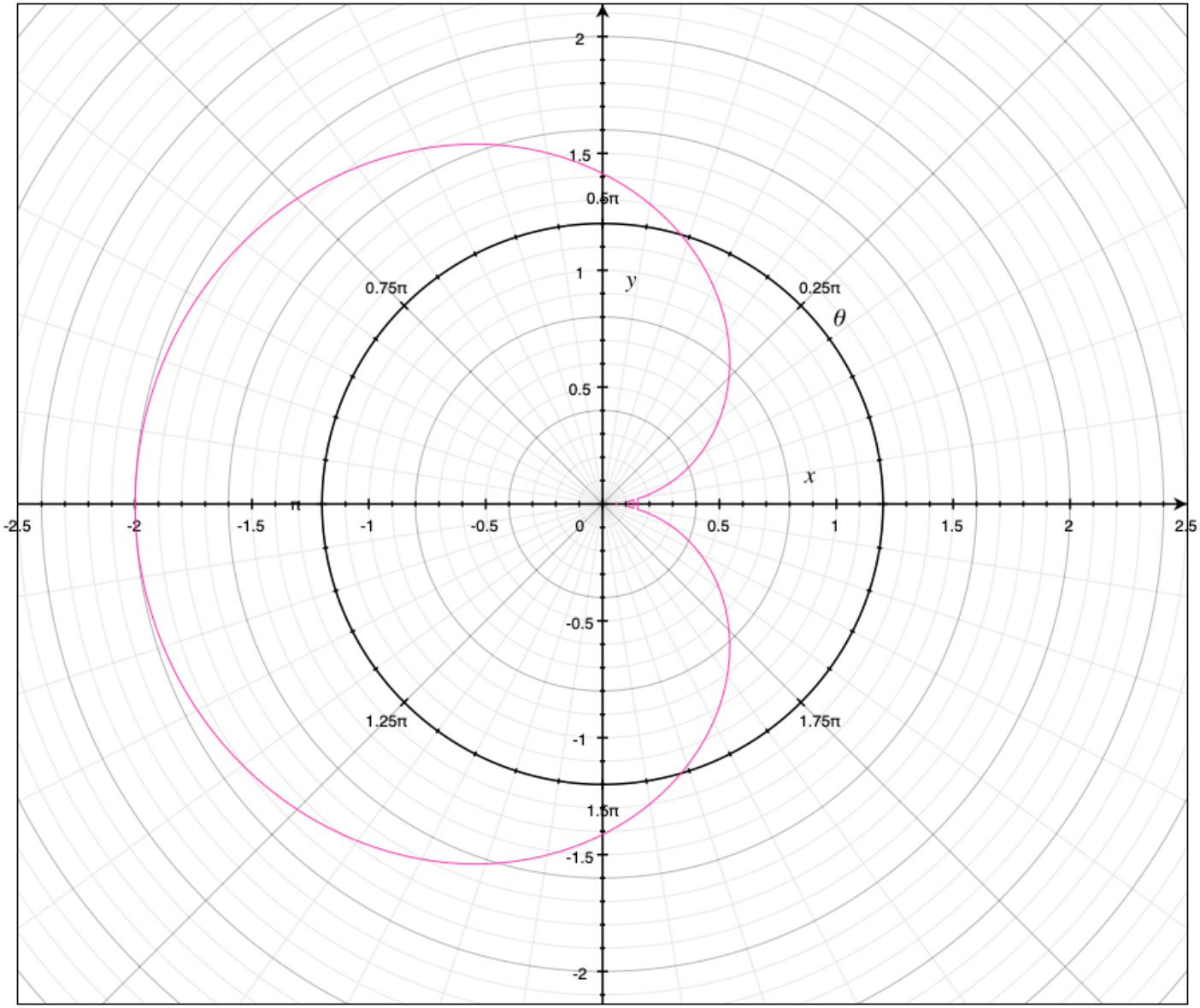
mus174a - figure 8 microphone

- aka - pressure difference microphone, bidirectional microphone
- sound pickup in front and back, cancelled on sides
- worst natural bass response/most proximity effect
- good for picking up artist and room reverb



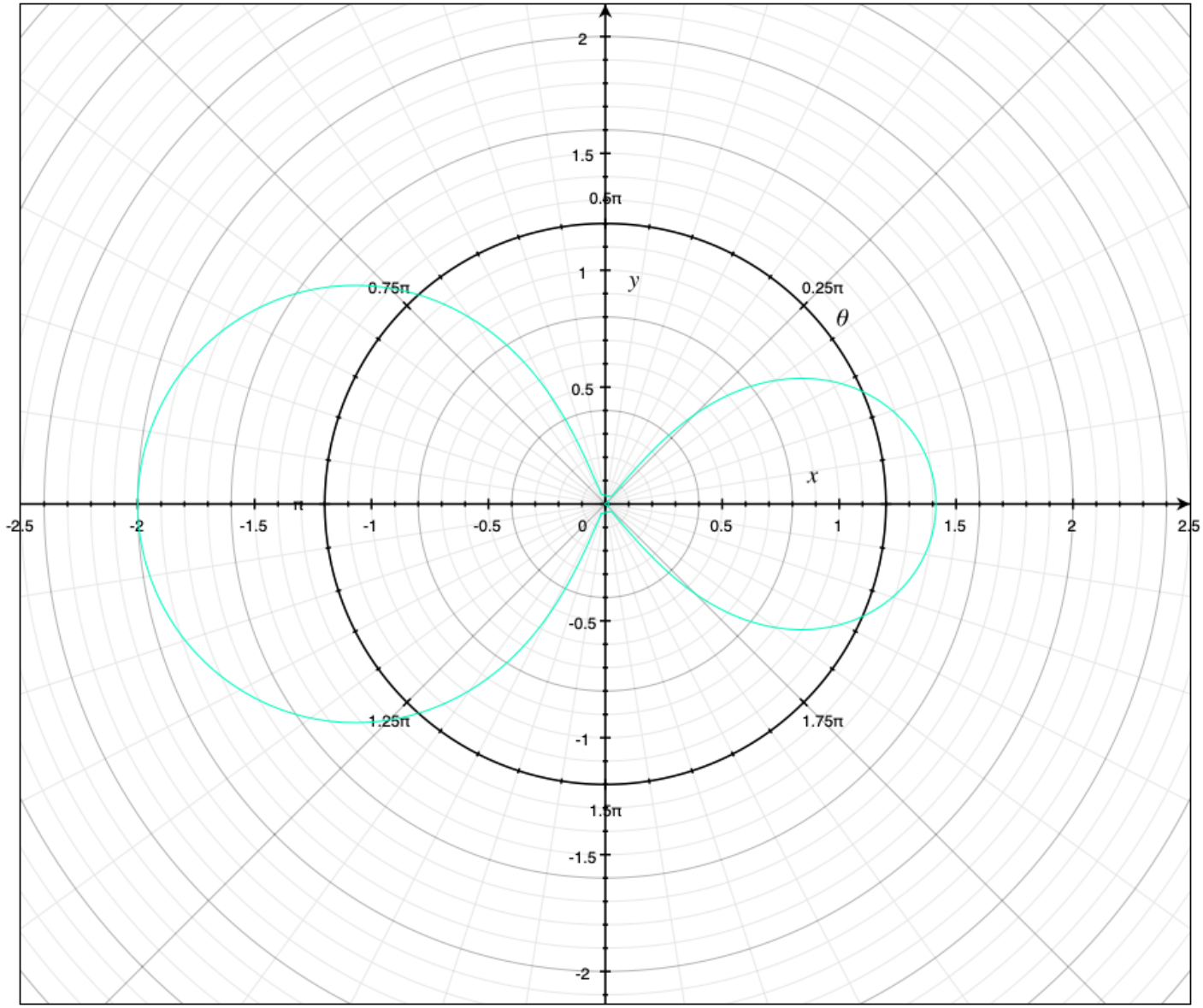
mus174a - cardioid microphone

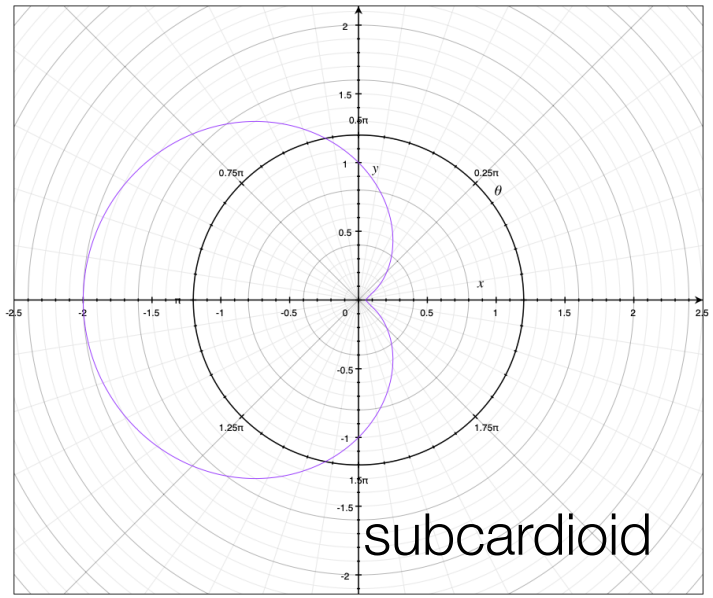
- aka - unidirectional microphone, pressure gradient microphone
- pickup mostly in the front of the mic
- most common pattern
- great for instrument isolation
- medium proximity effect

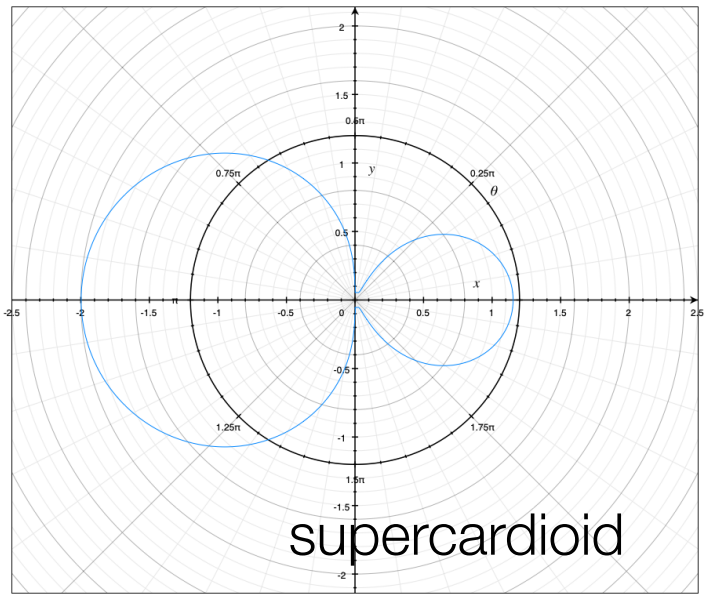


mus174a - hypercardioid microphone

- somewhere between cardioid and figure 8
- used when more isolation is needed
- beware of the back lobe
- more proximity effect



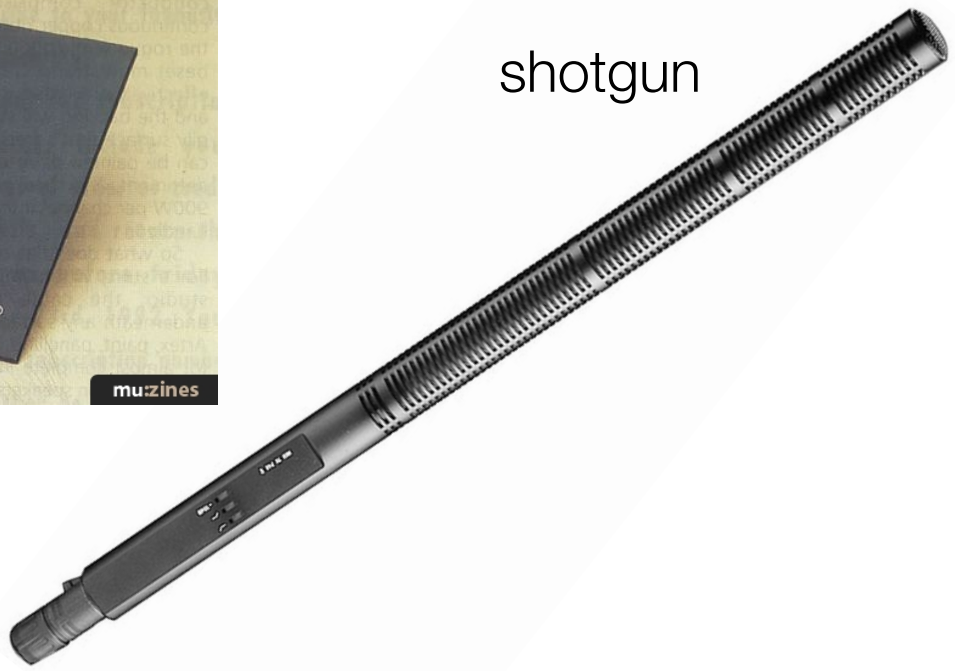




parabolic

pressure zone

shotgun



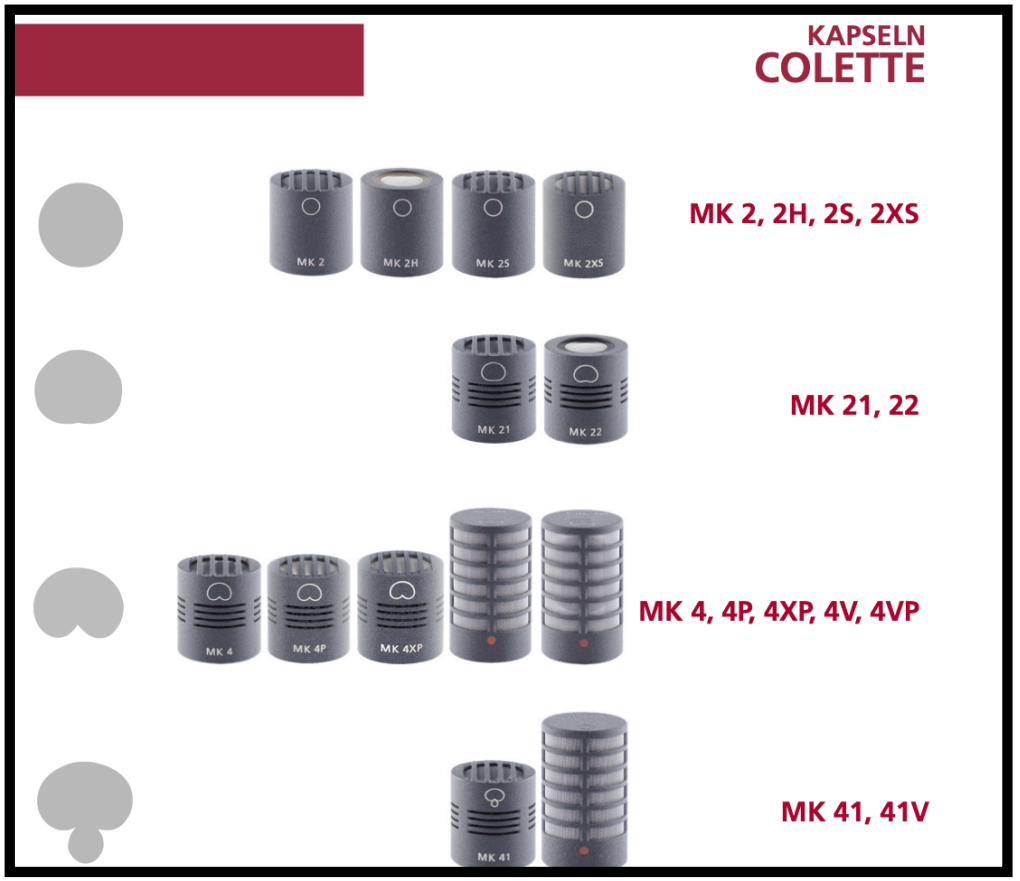
binaural

mus174a - other patterns & types

mus174a - multiple pattern

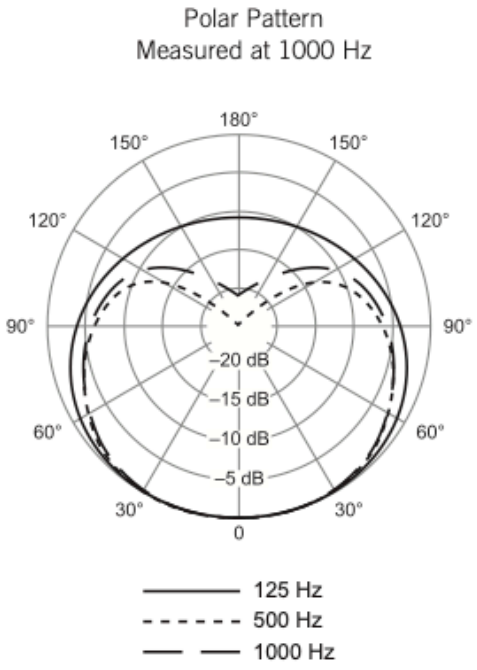
switch

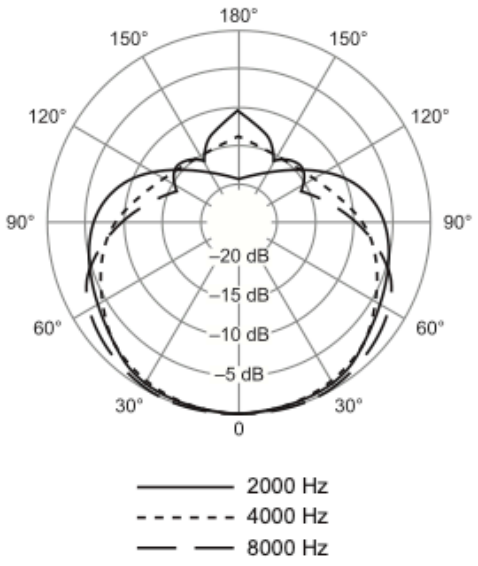
capsule

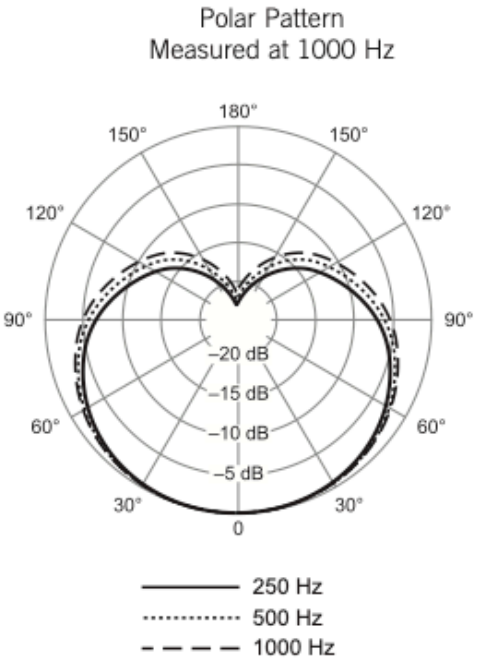


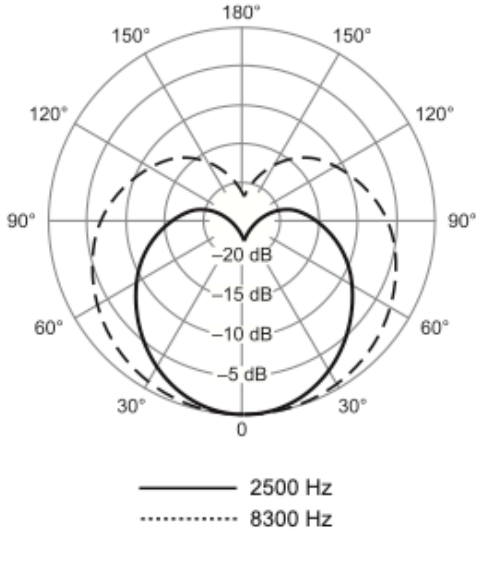
mus 174a - polar pattern frequency response

Microphone pickup pattern isn't uniform among different microphones. Here are the polar patterns for two dynamic cardioid microphones. The bottom one is much more directional, but also a very narrow pattern at 2500 Hz. Shure SM58 top, Shure SM7 bottom.









mus 174a - stereo recording techniques

- these are methods using 2 microphones to capture sound in stereo.
- often used in acoustic recording on stage to record the “real” sound of the performance.
- used in field recording to give a full sense of space.
- in the studio, used whenever a stereo recording of an instrument is desired (drum overheads, piano, ac. guitar, organ, vocal group

mus 174a - blumlein technique

- Developed in 1931 by Alan Blumlein at Abbey Road studios in London
- Uses 2 figure 8 microphones with a 90 degree offset from each other. Front of mics pointed at -45 and 45 degrees.
- Picks up room as well as musician. Distance is important to vary the liveness of the sound.

mus 174a - x/y coincident technique

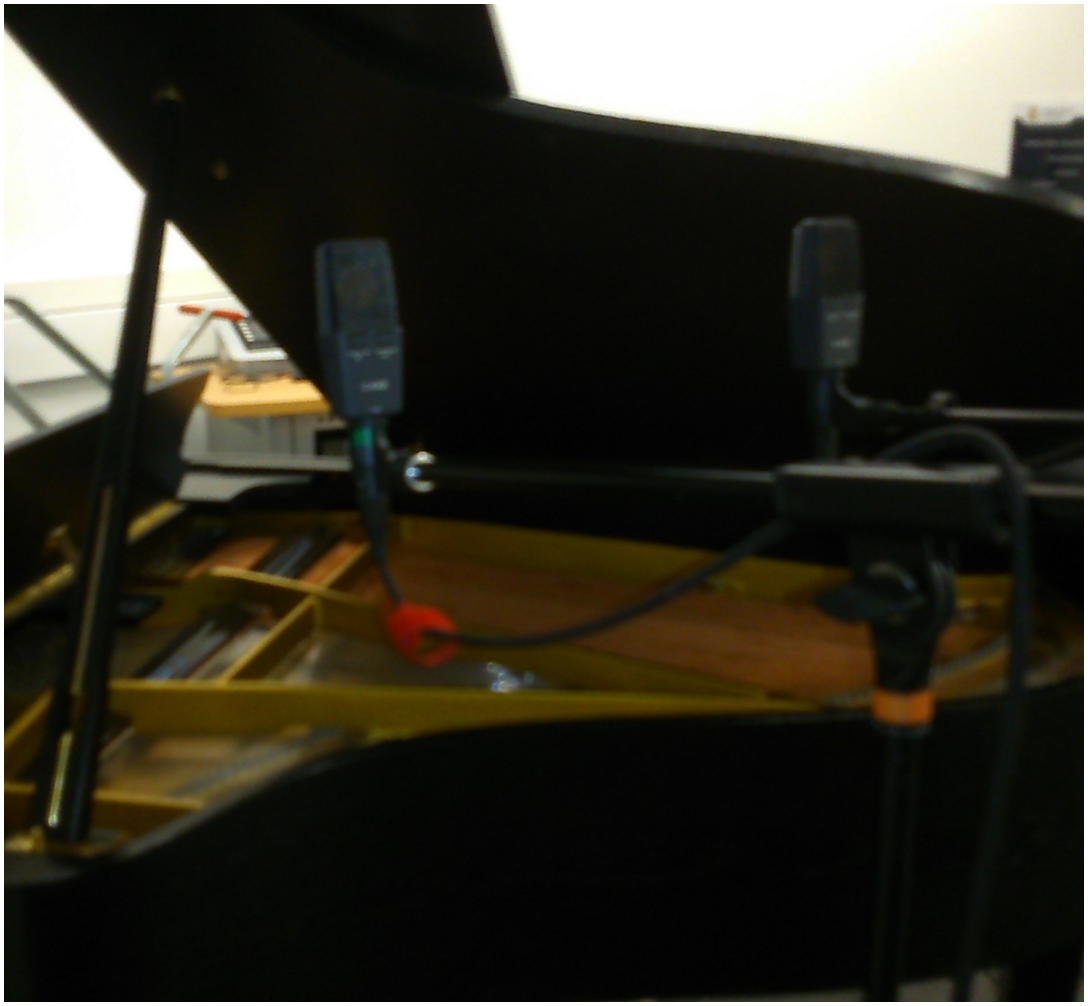
- Separation of mic capsules can cause ugly filtered sound (comb filtering).
- Placing the mic capsules right next to each other (coincident) eliminates this filtering.
- It also insures that transients aren't smeared between the two microphones.
- Microphones are angled anywhere from 90 to 120 degrees to pick up stereo field.
- Too large of an angle will make for less volume in the middle.

mus 174a - near coincident technique

- Separation of capsules can make for a softer sound.
- Negatives become positives. Smearing of transients = warm sound. Comb filtering = natural sound.
- The idea behind this is that our ears are separated - why not microphones?
- Three common techniques: ORTF (110 degrees, 17 cm), NOS (90 degrees, 30 cm), Jecklin disc (40 degrees, 36 cm).

mus 174a - spaced omnidirectional

- Mics are separated by 40 to 90 cm. Also known as AB technique.
- The separation of microphones makes for a much larger, more diffuse sound. Localization is difficult with this technique.
- Both mics are same distance from instrument to reduce comb filtering.
- Often used for classical guitar recording, or drum overheads.



mus 174a - mid/ side technique

- One cardioid mic is pointed to the center, one figure 8 mic is pointed to the sides.
- The mics are added and subtracted to get left and right. M+S = L, M-S = R. Subtraction can be done by phase inverting (ø) the side and mixing.
- Varying the amount of side can make space seem larger or smaller.
- Plugins are available to do the MS to LR conversion.

mus174a - other stereo techniques

- Binaural head (“Fritz”)
- Decca Tree
- outrigger microphones
- DIN stereo
- Ambisonic: tetrahedral or octahedral microphone