Double Bass
Homemade Recordings

João Pedro Almeida Lucas

Main Subject: Classical Double Bass

Student Number: 013041

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Main Subject Teacher: Quirijn van Regteren Altena

Research Supervisor: Maggie Urquhart

Circle Leader: Martin Prchal

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Table of Contents

1. Introduction **1**

2. Research Question **2**

3. Research Method **3**

4. The Microphone **5**

5. Recording Experiments **15**

6. Recording Setup Example **34**

Conclusions and Afterthoughts **37**

Bibliography **38**

Introduction

Musicians today are required to send recordings of their work for competitions, auditions and simply for self-promotion. Few musicians can afford the use of a studio with qualified technicians to achieve the best result. However, nowadays, there is low budget equipment (microphones, sound cards, hand recorders, among others) that, when used in a proper way, can provide us with good results. Being fascinated by the recording and studio worlds, I began to take an interest in this particular matter.

After a year of researching and attending classes, in order to acquire more knowledge about microphones and recording techniques in general, I started some recording experiments. I focused mainly on the double bass in a solo context, for example using different microphones and hand recorders for different acoustics and types of repertoire.

To conclude this research, I would like to bring together the experiments and relevant knowledge in a “Guide for double bass homemade recordings”. The aim of this would be to make clear, and thus accessible to every double bass player, the different ways of recording this instrument, by providing recording set-up examples in accordance with the repertoire, acoustics and equipment available. My hope is that any bass player would be able to rely on this guide to obtain the best results with their homemade recordings of the the pure and honest sound of the double bass.

Is it important to emphasize that this research is relevant to the double bass in a solo context and only involves using microphone techniques to capture the sound of the instrument, without utilizing sound editing in any way.

How does one obtain the pure sound of the double bass in a homemade recording?

Very often I find myself debating with other double bass players about the quality of their recordings and ways of recording. The general opinion of most bass players I have spoken to, who had some experience in professional recordings, is that the double bass is a very difficult instrument to record. Due to its low frequencies, it is hard to pick up an accurated sound from the instrument.

'The pure sound of the double bass', as I mentioned earlier on, is for me nothing more than the sound that allows you to recognize and identify yourself in your recordings. To get these results, it is important to clarify some concepts about recording equipment and recording techniques.

The first aspect to consider should be the equipment that is available for the recording and how to use it properly. One of the points of this research is to get the best results from a homemade recording without having to spend too much money on top quality equipment. Another important aspect is the repertoire to be recorded. In the end, it is a matter of taste, but, through my recording experiments with the double bass, I found out that microphone placement has to change in accordance with the type of recording, for example an orchestral excerpt or a solo piece. On top of this, the room that will be used for the recording needs some attention as well. It is in the interest of the person who will record, to have a quiet environment. Very often, in homemade recordings, we hear a lot of the surrounding sound. It is more noticeable when using a hand recorder, due to its wider frequency range and also the high input level.

In order to make trustworthy comparisons, I had to invest in some equipment. All my experiments were made using the same microphone brand.

Research method

The first step that I took when beginning this research was to look for information in many different forms (audio, video, guides, etc.) related to my topic. I found very little information, and most of it was about the jazz double bass. It is important to explain that all the researching and experiments I've been making are about the classical double bass in solo context, without piano or any other instrument. with the purpose of recording for auditions, competitions, as well as self-promotion, and other ends. It is not my intention to find the perfect solution to record the double bass, but to find a way to get the best possible quality from a homemade recording.

Having in mind that the budget to afford top quality equipment may be a problem, the experiments that I have made for this research were made using only low budget equipment.

Before starting my experiments, I had the chance to have lessons with highly qualified teachers at the art of sound department. During the academic year of 2015-2016, I attended classes of Electroacoustic 1 and Room Acoustics. In Electroacoustic 1, I went in depth into the microphone field, which was very useful and taught me the most important components for my research. Room acoustics, on the other hand, turned out to be of less importance for this research, since it was too technical. I wanted to keep the homemade spirit through my investigation.

During all the work about the microphone placement, the input level and cable connections, I realized I was taking too much time. So, I decided to contact some fellow double bass students who, by playing at my place while I made the recording, would save me time and energy to focus on details. This also provided me with enough material to use in my investigation.

Before each recording experiment, I had to make a plan. In order to coherently compare the data, it is important to have the same microphone, the same microphone placement (the microphone located above or under the bridge, the f hole, the tailpiece, among others), the same polar pattern as well as the same input level.

My first experiment recording other people was with two different bass players, two different instruments, but with the same microphone, the same input level, the same polar patter and the same distance of the microphone from the sound source. The results showed that the simple fact of having a different player or instrument can make a great difference. This fact which until then I had not noticed, became an important factor to consider alongside this research.

Goals

- To acquire more knowledge about recording the double bass

As I explained before, I am fascinated by the recording process and recording studios. The knowledge I have been looking for is primarily to indulge this fascination but also to apply it to my professional carrier.

- To create, in the near future, a guide that can help other bass players in their home recordings

I believe this is a quite relevant topic for other bass players in their own home recordings. Therefore, my long term goal is to create an easy reading guide ('How to…' style) without becoming too technical, but being very precise about what can be done to improve double bass home made recordings.

Aspects to consider

Before I could start working on this research, I had to find out which factors would be relevant in my investigation. I decided to take three into consideration:

- Equipment available

It is important, when planning a recording, to have an idea of the equipment available (type of microphones; hand recorder; cables; sound card; etc…)

- Repertoire to be recorded
- Room for the recording

The Microphone

What is a microphone?

A microphone is a device that converts sound into an electrical signal. This kind of device is called transducer, because it converts one form of energy to another. Usually, the microphones need to be connected to a preamplifier before the signal can be recorded or reproduced. The most common transducer types, and also the ones focused on this research, are the Dynamic, the Ribbon and the Condenser.

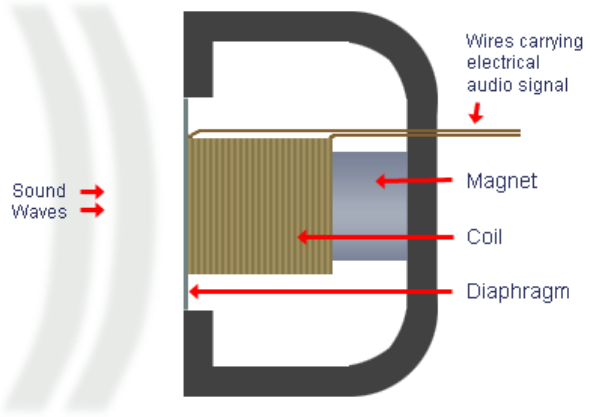
'*Discussion about the difference between dynamic microphones and condenser microphones never ends. To that end, we must clarify a few things: The difference between dynamic microphones and condenser microphones is all about two different transducer principles. It has nothing to do with the directional characteristics of the microphones.* '[1]

[1] Eddy B. Brixen, *10 statements on dynamic vs condenser microphones* (www.dpamicrophones.com)

Types of transducers used for this research:

• Dynamic microphone

The dynamic microphone is a transducer that works by electromagnetic induction. The theory of the electromagnetic induction states that whenever an electrically conductive metal cuts across the flux lines of a magnetic field, a current of a specific magnitude and direction will be generated within that metal. The dynamic microphone uses the same principle as in a loudspeaker but, in this case, reversed.



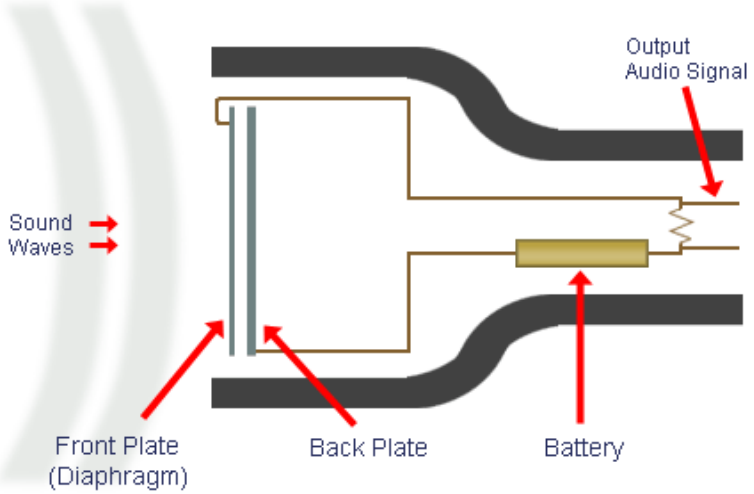
Source: www.mediacollege.com

Characteristics:

- Smaller frequency range compared to condenser microphones
- Don't need external power supply

• Condenser Microphone

The condenser microphone also known as the capacitor[2] microphone, is a transducer that works by electrostatic induction, which is a redistribution of electrical charge on an object caused by influence of nearby charges. On the condenser microphone capsule there are two plates, one very thin and movable and the other one is fixed on the back. When a sound wave hits the diaphragm of the microphone, the thin plate moves towards the back plate creating capacitance .



Source: www.mediacollege.com

Characteristics:

- Higher sensitivity
- Needs external power supply (Phantom Power)
- Wider frequency response

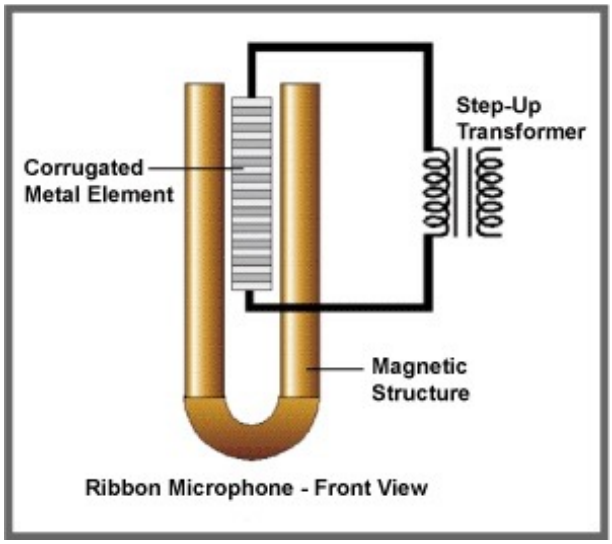
[2] The capacitor is an electrical device that can store an electrical charge temporarily.

The condenser microphone vs dynamic microphones

'One microphone is not louder than another; it is just a question of sensitivity. In general, condenser microphones exhibit a higher sensitivity than dynamic microphones. Either way, the sensitivity should always be chosen relative to the requirements of the job.'[3]

Ribbon Microphone

A ribbon microphone, also known as a ribbon velocity microphone, is a type of microphone that uses a thin aluminum of electrically conductive ribbon placed between the poles of a magnet to produce a voltage by electromagnetic induction. Ribbon microphones are typically bidirectional, meaning that they pick up sounds equally well from either side of the microphone.



Source: http://blog.shure.com/

Characteristics:

- Fragile microphone
- Requires careful handling
- Low output (Most common)
- Very warm sound

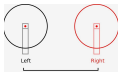
[3] DPA Microphones - (http://www.dpamicrophones.com/mic-university/10-statements-on-condenser-microphones-vs-dynamic)

Hand Recorders or Field Recorders

Nowadays, hand recorders are very common and very practical for homemade recordings. However, it is important to point out a few aspects of this kind of device. Hand recorders have built in microphones with different stereo settings (XY and AB shown on the images). They also have a wider frequency range. The following aspects should be taken in consideration while using a portable recorder:

- Placement;
- Input level;
- Low cut on/off;
- Gain;
- Peaks.

Like any other microphone, if a hand recorder is used with high input levels it may cause some peaks on the recording. Other unwanted sounds like the 'dust' (very present in this kind of recordings) from the surrounding sounds of the room (air conditioned for instance) and from outside (traffic, tram, people, among others), can easily be present on a recording made with this recording equipment.



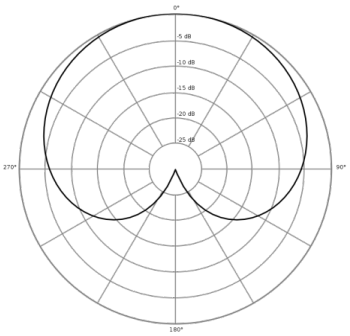
Source: www.thomann.de

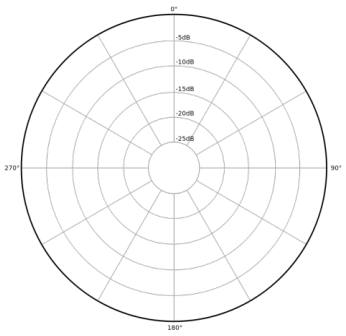
Microphone Polar Pattern (Directivity)

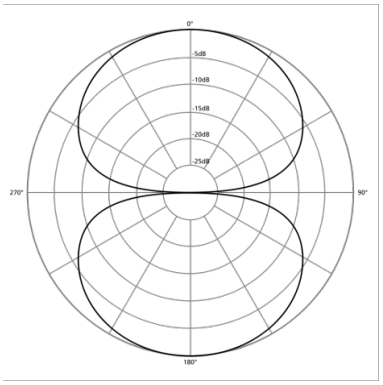
The polar pattern, or directional response of a microphone refers to its sensitivity at various angles of incidence, with respect to its central axis (0 degree).

In simple terms, the polar pattern is the microphone sensitivity to a sound, in relation with the direction or angle from which the sound arrives. This research focuses on the Cardioid, Omnidirectional and Figure of 8 polar patterns.

Cardioid **Omnidirectional** **Figure of 8**







Cardioid: 'A cardioid microphone has the most sensitivity at the front and is least sensitive at the back. It isolates from unwanted ambient sound and is much more resistant to feedback than omnidirectional microphones'[4]

Omnidirectional: 'The omnidirectional microphone has equal output or sensitivity at all angles, this means it picks up sound from all directions'.[5]

Figure of 8: 'A microphone with a figure of eight polar pattern picks up the sound from in front of the microphone and from the rear but not the side (90 degree angle)'.[6]

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[4] Shure, *Microphones polar patters (*http://www.shure.eu/support_download/educational_content/microphones-basics/microphone_polar_patterns *)*

[5] Shure, *Microphones polar patters (*http://www.shure.eu/support_download/educational_content/microphones-basics/microphone_polar_patterns *)*

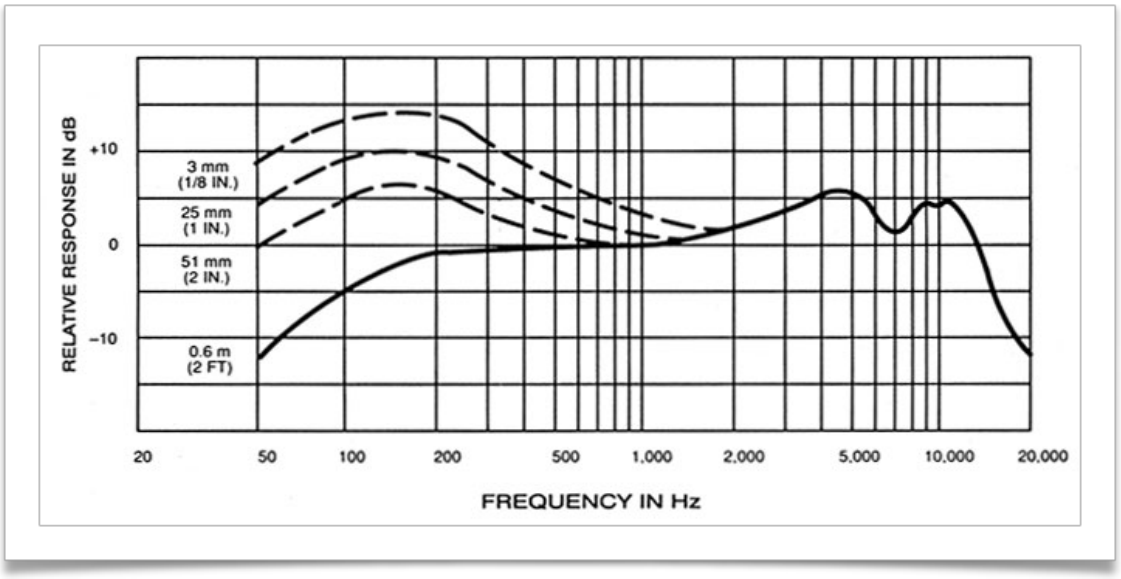
[6] Shure, *Microphones polar patters* (http://www.shure.eu/support_download/educational_content/microphones-basics/microphone_polar_patterns)

Microphone Characteristics

Proximity Effect

The proximity effect was one of the characteristics that became very clear in my recordings. After analyzing the results, my focus was directed to solving this issue by exploring the distance between the microphone and the sound source.

The proximity effect is a phenomenon that happens on directional microphones (Cardioid and Figure of 8 polar patterns). It is an increase on the low frequencies when the microphone is moved closer to the sound source. The closer it gets the bigger the boost is. Usually the proximity effect is most noticeable on frequencies below 200Hz.



Stereo Recording Techniques

A stereo recording technique consists of the use of two microphones to create a stereo image. Both microphones should be coincident (the same brand and model).

'*One of the most popular specialized microphone techniques is stereo miking. This use of two or more microphones to create a stereo image will often give depth and spatial placement to an instrument or overall recording'*[7]

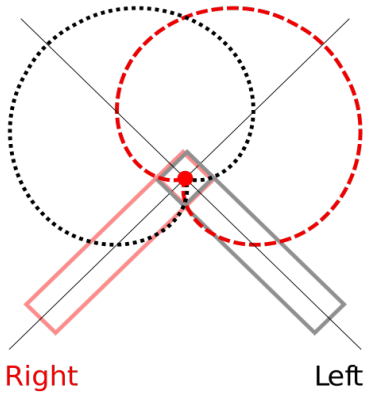
The stereo techniques explored in this research were:

XY

The X-Y technique consists of two directional microphones. Microphones with a cardioid polar pattern are the most common on X-Y Setups, angled at 90º.

'*Theoretically, the two microphone capsules need to be at the exactly same point to avoid any phase problems due to the distance between the capsules. As this is no physically possible, the best approximation to placing two microphones at the same point is to put one microphone on top of the other with the diaphragms vertically aligned'.* [8]

The center of the microphones should be pointing out, towards the sound source.



Source: https://en.wikipedia.org/wiki/Microphone

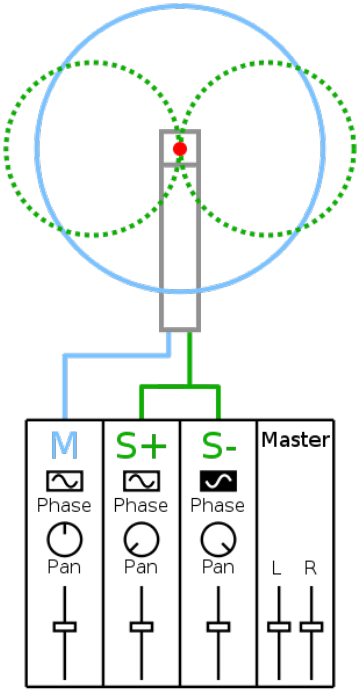
[7] Shure, *Microphone Techniques for recording (*http://cdn.shure.com/publication/upload/837/microphone_techniques_for_recording_english.pdf)

[8] DPA Microphones, (http://www.dpamicrophones.com/mic-university/principles-of-the-xy-stereo-technique)

MS (Middle-Side)

The MS technique was the most fascinating stereo technique I learnt about on the electro acoustics course. This technique is a combination of two microphones. One of them should have a figure of 8 polar pattern, and the other should have a cardioid or omnidirectional polar pattern. The Figure of 8 microphone should be facing sideways and the cardioid microphone should be pointing directly to the sound source.

This stereo technique requires some pre-work on the DAW (Digital Audio Workstation). Using this software, three audio tracks should be opened. The figure of 8 microphone should go into two tracks. One of these tracks should have the phase reversed so that we can get '+' from both sides. The figure of 8 tracks that we call 'SIDE', should have the 'pan' buttons for both sides, one to the left and one to the right (see image). The cardioid or omnidirectional microphone, that we call 'MIDDLE', should be on the remaining track. After the recording, the input level can be adjusted. By using the faders from the 'SIDE' tracks, we can get a more spacial sound, and by using the fader from the 'MIDDLE' track, we can have a more crisp and direct sound from the double bass.



Source: https://en.wikipedia.org/wiki/Microphone

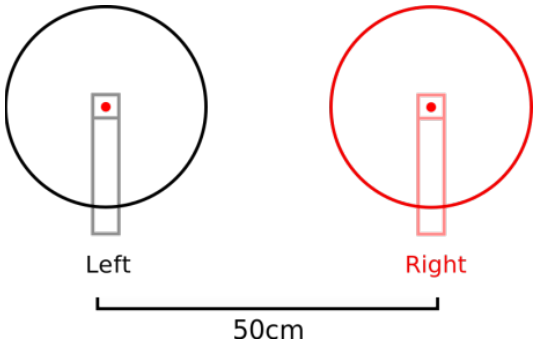
AB

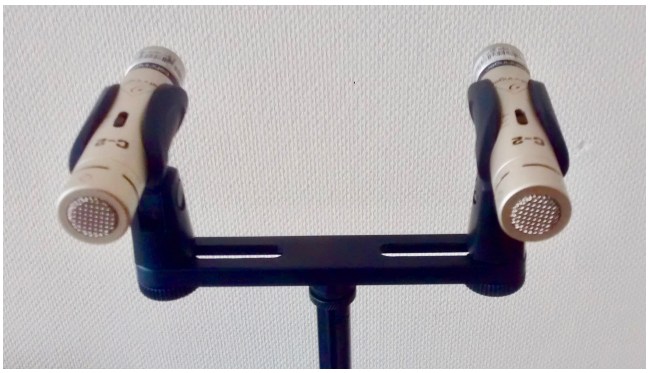
The AB stereo technique, also called 'the spaced pair', is a technique that uses two (coincident) microphones, cardioid or omnidirectional polar patterns. They should be placed apart from each other (see image).

The stereo image on this technique is created by difference in time. This is the time that a sound wave takes from the moment it hits the diaphragm from one of the microphones to the time of traveling to the other.

'An important consideration when setting up for A-B stereo recordings is the distance between the two microphones. What the stereo recording should sound like is often a question of taste, which makes it difficult to give exact rules on spacing.'[9]

Although this technique gives a very spacial sound to a recording, I didn't use it much in this research. The use of this technique makes more sense when recording an ensemble and not a solo instrument. A misplacement of the microphones when using the AB technique can create phase problems, and as a result we have a very weak sound on the recording.





Source: https://en.wikipedia.org/wiki/Microphone

[9] DPA Microphones - (http://www.dpamicrophones.com/mic-university/principles-of-the-a-b-stereo-technique)

Recording Experiments

All the recording experiences for this research were made with the same equipment from the same brand, so as to exclude the brand difference as a factor.

List of equipment:

- **Behringer B2 Pro Condenser Microhphone**

Condenser Microphone

Multi Patter (cardioid, figure of 8 and Omnidirectional)



- **Behringer C2 Stereoset**

Stereo Set

Condenser Microphones

Polarity: Cardioid

- **MXL R144 Ribbon Microphone**

Ribbon Microphone

Polarity: Figure of 8

- **Peavey PV100 Dynamic microphone**

Dynamic Microphone

Polarity: Cardioid

- **Roland R-05 Handrecorder**

Hand Recorder

Stereo Built in Microphones

Polarity: Cardioid

- **Focusrite Saffire 6 USB Audio Interface**

An audio interface is a device that converts an analogic audio signal into digital signal. The audio interfaces can be connected to a computer through USB, Firewire or Thunderbolt plugs.

- **DAW (Digital Audio Workspace) - Logic pro or similar software.**

Close Miking Recording

Equipment used:

- Condensador (multi pattern);
- Stereo Set;Sound Card;
- DAW (Reaper).

Microphone placement:

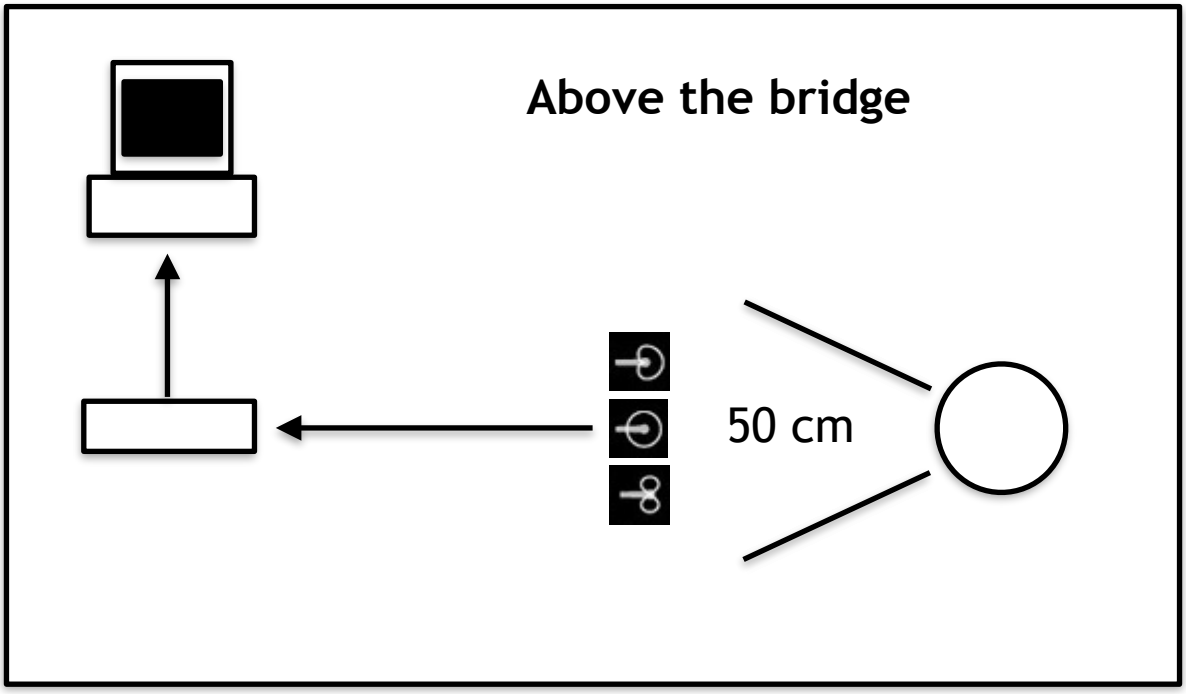
- 50 cm from the sound source (above the bridge);
- 30 cm from the sound source (under the bridge).

Settings:

- Caridoid;
- Figure of 8;
- Omnidirectional
- XY.

Description of the recording:

In this experiment, I recorded two different bass players with two different instruments. I used a multi pattern microphone (Cardioid, Figure of 8 and Omnidirectional). The microphone had the same placement and the same polar pattern for both instruments. The goal of these recordings was to explore close microphone placement (close miking).



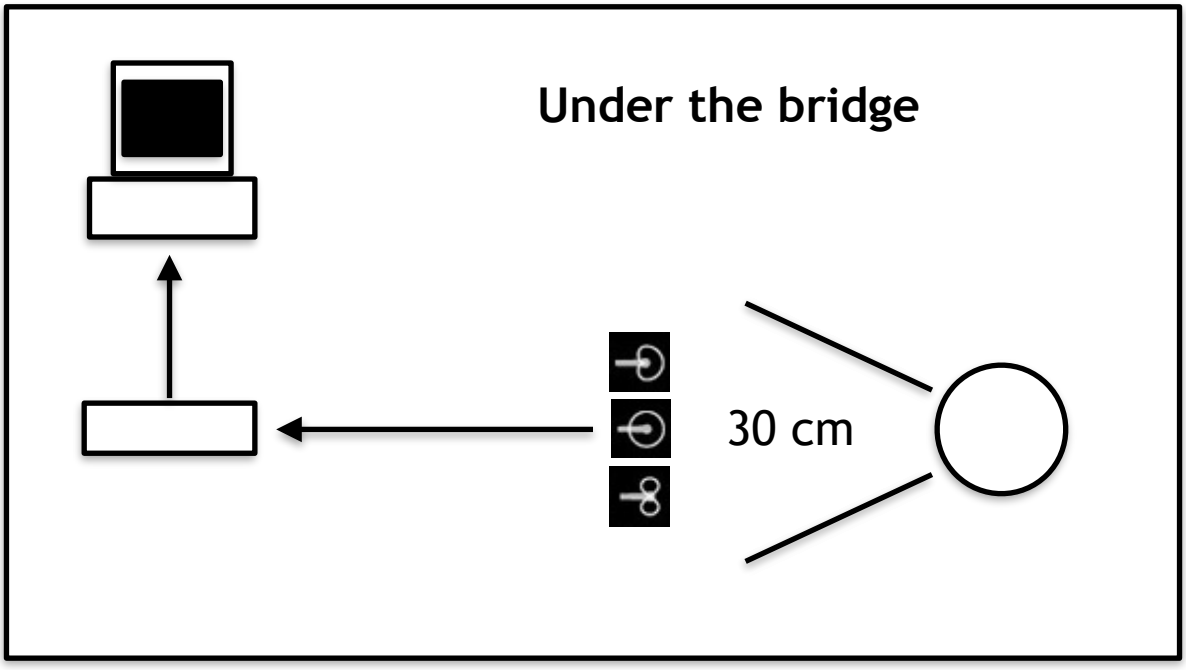


Fig. 8 Cardioid Omni MS XY Sound source Audio interface Computer DAW

Conclusions:

While analyzing the recordings made with this setup, it became very clear how easy it is to get the proximity effect when close miking is used to record the double bass. The highest string of the double bass is G2 (98Hz). Since the proximity effect is most noticeable bellow 200Hz , it can be very easy to have this effect on a recording. Although the sound is very full, it also sounds somehow fake and without the spacial sound.

I did 12 takes in total for this recording experiment (3 for each player with the 3 different patterns above the bridge, and 3 for each player with the 3 different patterns under the bridge). In my opinion, close miking is definitely not an option for recording the solo double bass (in the context described in the introduction of this research paper), due to the strong possibility of proximity effect, lack of resonance and reverberation, as well as the natural sound.

The proximity effect on the double bass

Knowing that the proximity effect is most noticeable below 200Hz, it means that until the note G3, which is 196Hz on the double bass, we will probably have this boost. With this said, when we use close miking to record the bass, the proximity effect should be taken very much in consideration.

The frequencies

Open Strings:

- E1 – 41.2 Hz
- A1 – 55Hz
- D2 – 73.4Hz
- G2 – 98Hz

The following images show a graphic equalizer with the proximity effect on the note A2 at 110Hz. This recording was made with close miking, placed above and under the bridge. On the three examples of each recording, the microphone (condenser multi pattern) was placed at exactly the same spot and with the same input level. Only the polarity was changed on each recording (cardioid, figure of 8 and omnidirectional).

Proximity effect on A2=110 Hz
Cardioid
Above the bridge
50 cm from the sound source

Proximity effect on A2=110 Hz
Figure of 8
Above the bridge
50 cm from the sound source

Proximity effect on A2=110 Hz
Omnidirectional
Above the bridge
50 cm from the sound source

Proximity effect on A2=110 Hz
Cardioid
Under the bridge
30 cm from the sound source

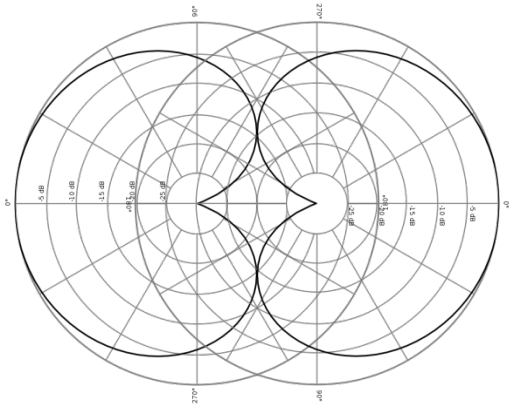
Proximity effect on A2=110 Hz
Figure of 8
Under the bridge
30 cm from the sound source

Proximity effect on A2=110 Hz
Omnidirectional
Under the bridge
30 cm from the sound source

Although omnidirectional microphones do not show any proximity effect, the same doesn't happen in multi pattern microphones. The reason for this is that the omnidirectional polar pattern consists of two back-to-back cardioids (pointing to 0º and 180º). When comparing the first and third images we can see that the shape is very similar.

The proximity effect might also change with different instruments and players. The other player's recording in this experiment showed almost no proximity effect at all.

While making my experiments, the microphone distance from the sound source was probably the factor that gave me the most different results.



Recording a solo piece Example 1

Equipment used:

- Condensador (multi pattern);
- Ribbon Microphone;
- Stereo Set;
- Sound Card;
- DAW (Reaper).

Microphone placement:

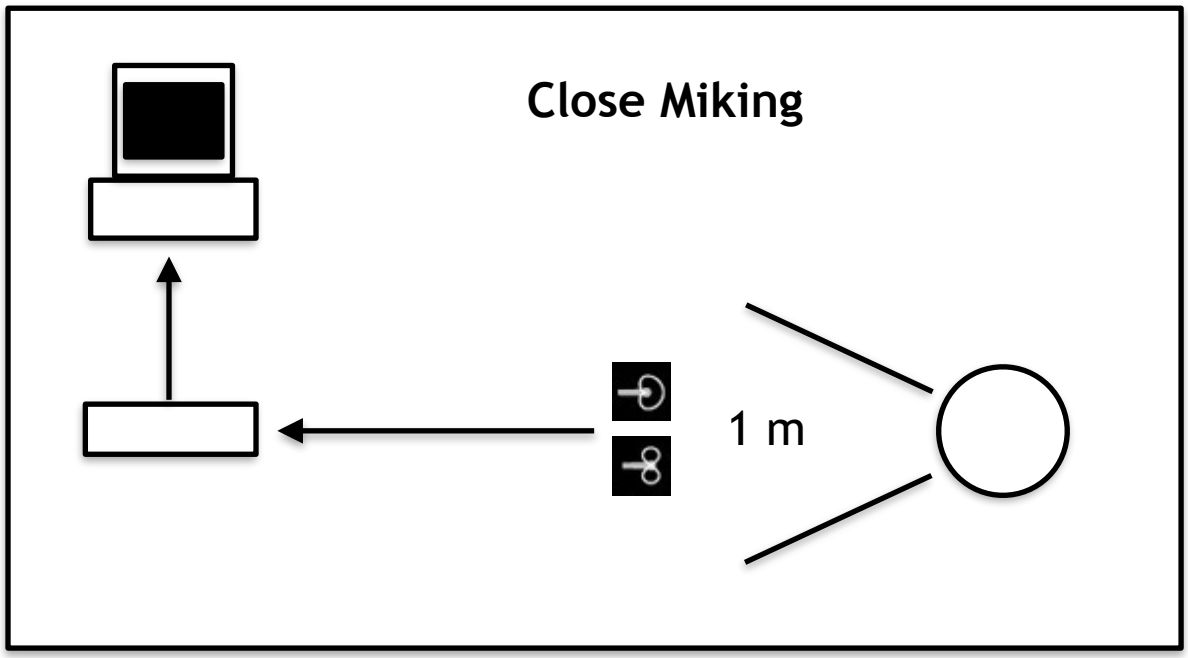
- 1 meter from the sound source;
- 2,50 meter from the sound source;
- 50 cm off axis (Ribbon Mic).

Settings:

- Caridoid;
- Figure of 8;
- XY stereo;
- MS;
- Ribbon.

Description of the recording:

In this experiment, I recorded a bass player performing a solo piece. This was the first experiment where I focused on stereo techniques. The omnidirectional microphone was removed from my experiments since I found out that an omnidirectional polar pattern in a multi pattern microphone is just two back-to-back cardioids.



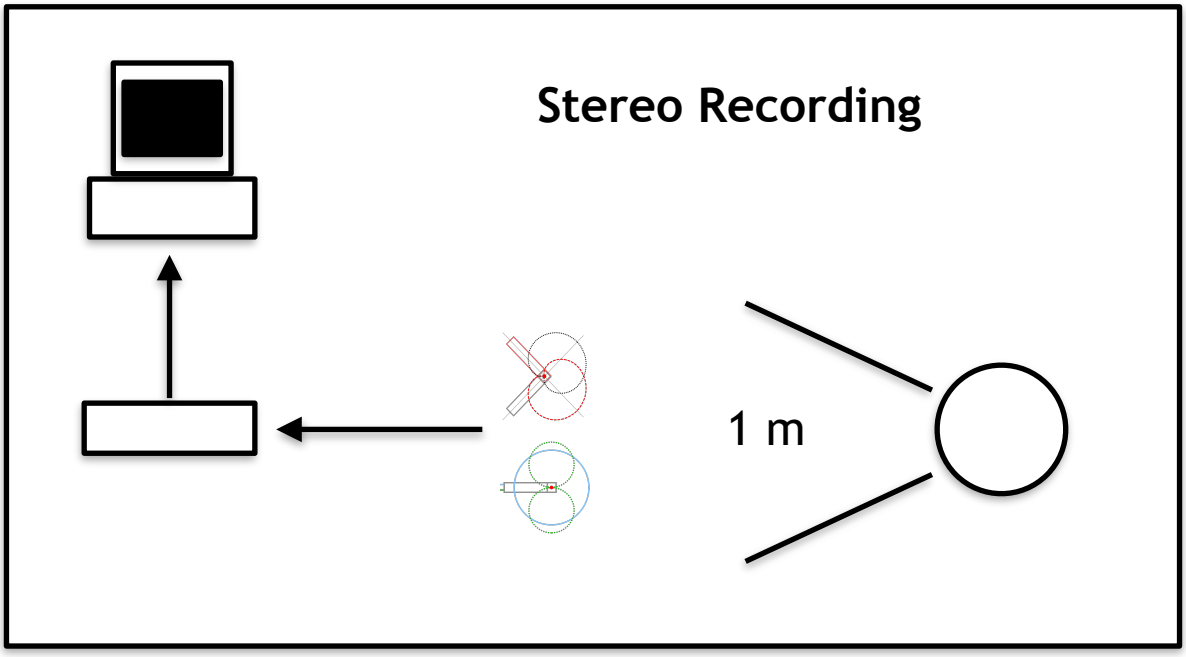
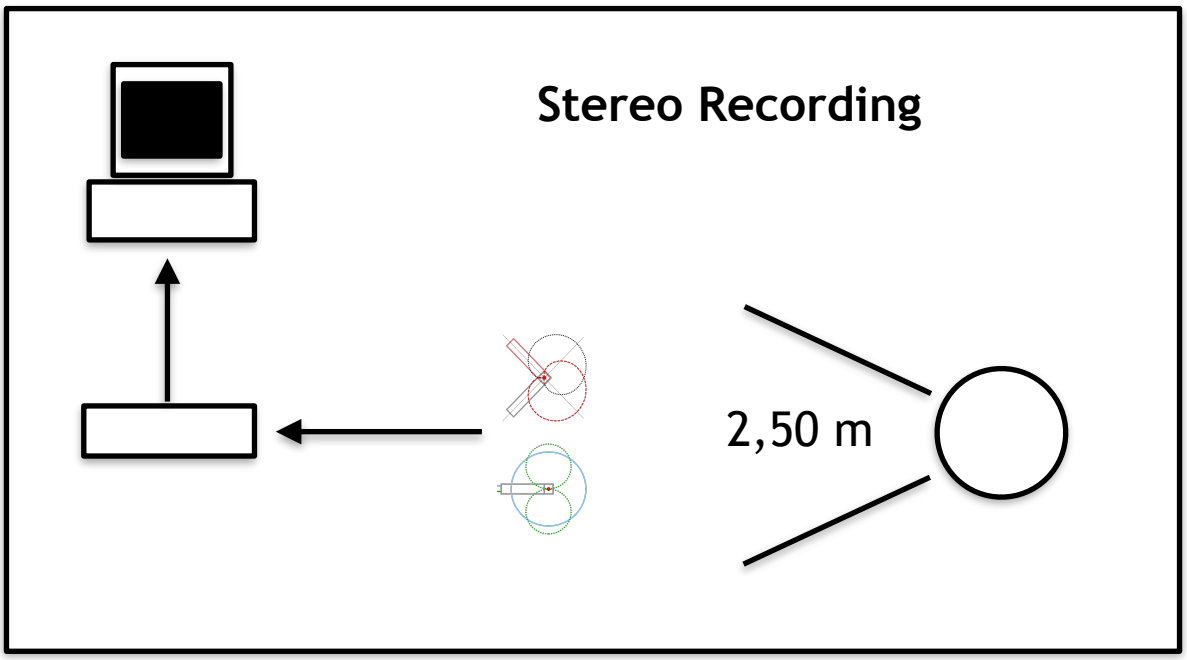


Fig. 8 Cardioid Omni MS XY Sound source Audio interface Computer DAW



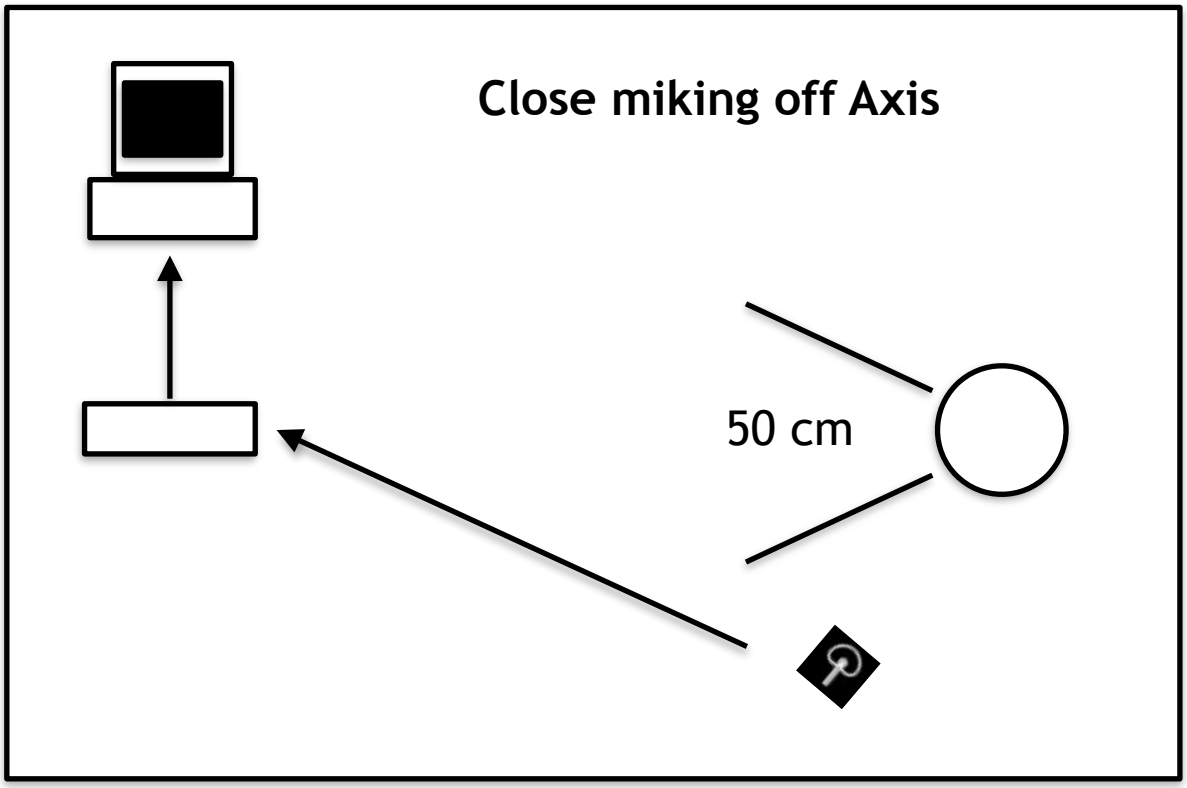


Fig. 8 Cardioid Omni MS XY Sound source Audio interface Computer DAW

Conclusions:

To concluded this experience, I realized that the ribbon microphone is not a good choice for a homemade recording. Although the sound captured by this type of microphone is very warm and round, I missed the sharpness in the sound of the double bass. Since the ribbon microphone polar patter is usually the Figure of 8, it can be used for the MS (Middle/Side) technique but with a very important aspect to take in consideration: the ribbon microphone cannot be used with phantom power[10] due to its nature. For these reasons, I excluded the ribbon microphone from my experiments.

On the other hand, the XY stereo technique turned out to be a very accurate way of recording the double bass, especially when placed further away (2,50 m on this experience). Comparing both XY takes (1 meter and 2,50 meter distances) the one at 2,50 meter showed a more bright and spacial sound that the one placed 1 meter from the sound source.

[10] External power (48+ volts) used only for condenser microphones

Recording for an orchestra audition

Equipment used:

- Condensador (multi pattern);
- Stereo Set;
- Sound Card;
- DAW (Reaper).

Microphone placement:

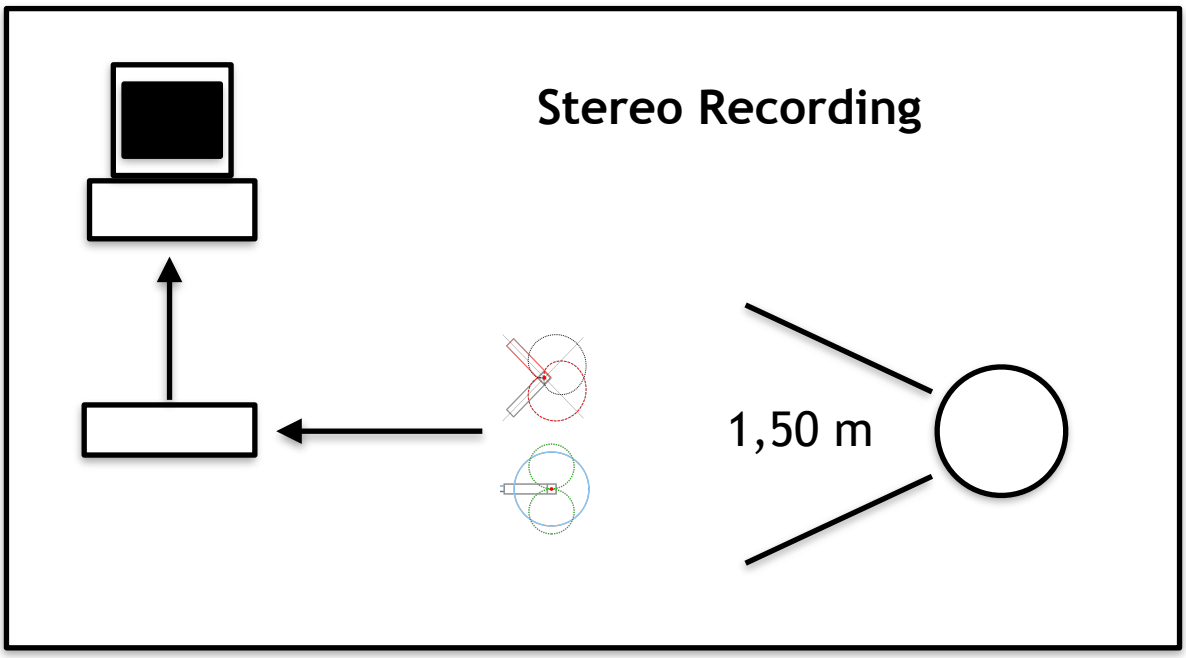
- 1,50 meters from the sound source.

Settings:

- MS Stereo technique;
- XY.

Description of the recording:

This recording was made for orchestral audition purposes. For this I used two stereo sets: the XY and the MS.



Conclusions:

With this particular instrument, the MS stereo technique turned out to be the most efficient. Due to the small room where the recording was made, I was missing some reverberation on the recording by using the XY stereo technique. With the chance to balance the middle and side microphones from the MS technique, I could achieve more low end and some room reverberation on the recording.

Fig. 8 Cardioid Omni MS XY Sound source Audio interface Computer DAW

Recording a solo piece Example 2

Equipment used:

- Condensador (multi pattern);
- Condenser Cardioid
- Sound Card;
- DAW (Reaper);
- Hand recorder AB stereo setting.

Microphone placement:

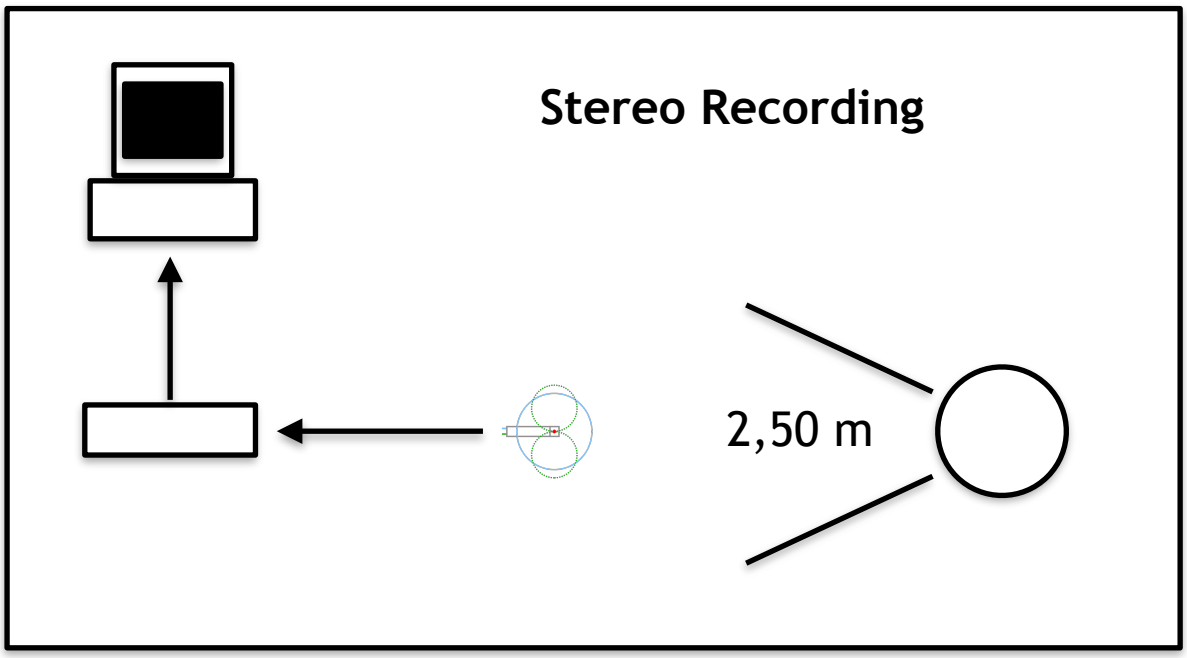
- 2,50 meters from the sound source (MS stereo setting);
- 3,50 meters from the sound source (Hand recorder).

Settings:

- MS Stereo technique;
- AB from the hand recorder.

Description of the recording:

This recording was made for self promotion purposes. For this experiment I used the MS stereo setting and a hand recorder at the same time in order to compare the differences in the surrounding sound of each recording.



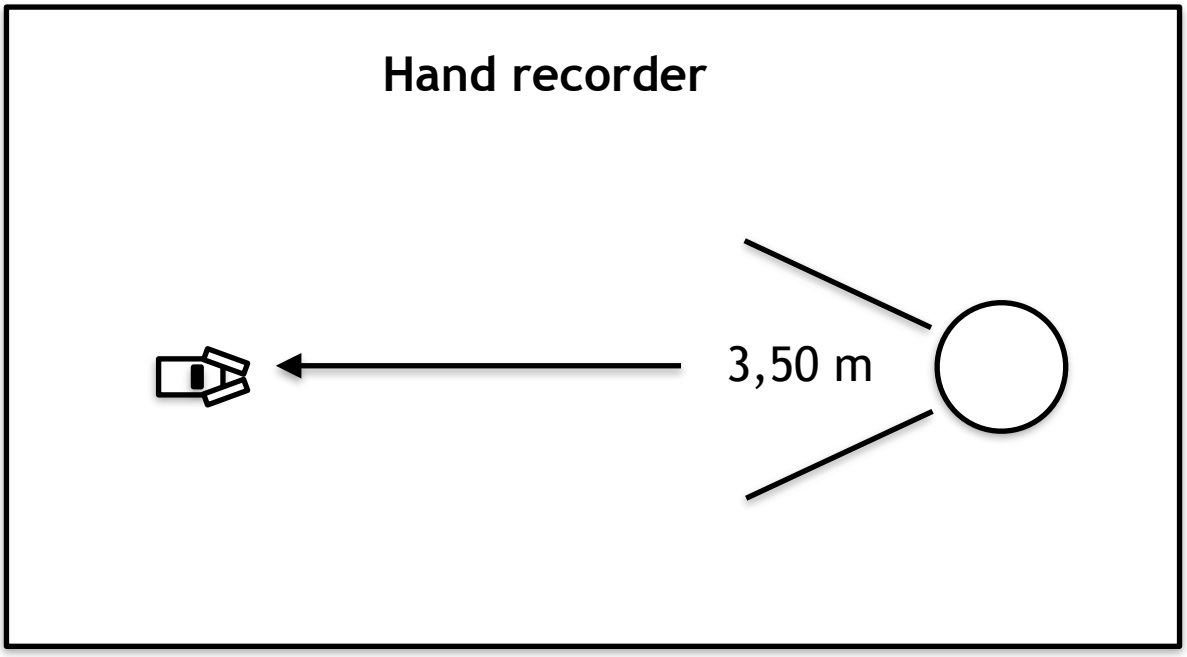


Fig. 8 Cardioid Omni MS Hand Recorder Sound source Audio interface Computer DAW

Conclusions:

The outcome from this experiment was that the MS stereo technique is very effective when used further away from the sound source. The room where the recording was made had too much background noise though. The hand recorder turned out to be less effective. Due to the huge frequency range of the hand recorder, many of the background noises were captured on the recording for instance the air conditioning, people from other rooms and noises from outside the building. I consider that the hand recorder placement shouldn't be too far from the instrument but just enough to avoid proximity effect.

Recording Preparation Example

Concerning this topic, I would like to present an example of what my guide for double bass home recordings will look like.

In this particular example, I will present how a bass player can use the XY stereo technique on a home made recording.

Through this research, I found out that the microphone placement can be influenced by different instruments as well as different players, repertoire and the room of the recording.

Required equipment:

- Two condenser cardioid microphones (coincident[11]);
- Microphone Stand with a stereo bar;
- Two XLR cables;
- Audio interface;
- Computer;
- DAW (Digital Audio Workstation).

Microphone placement

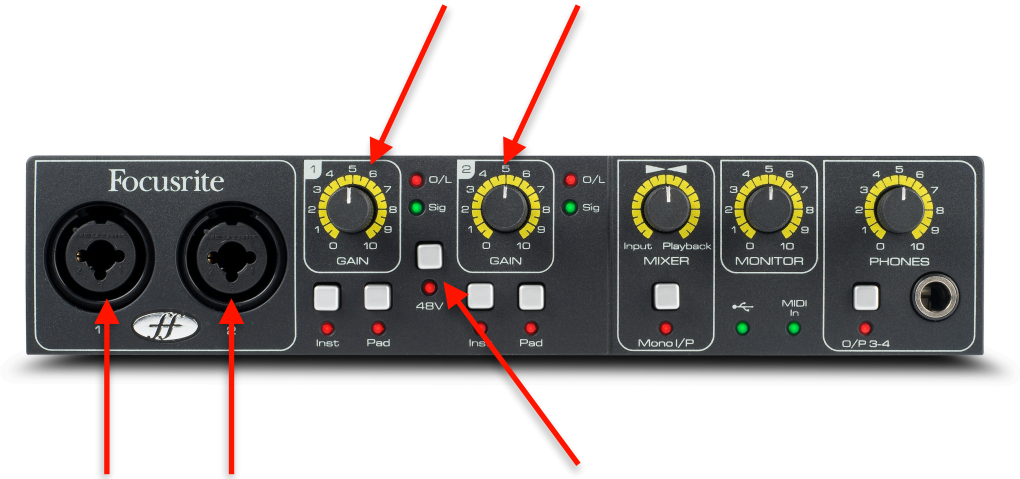
The two microphones should be placed with and angle of 90º.

The two capsules should almost touch each other.

[11] The two microphones should be from the same brand and same model.

Connection to the audio interface

Turn the INPUT buttons until you have signal
(both channels should have the same INPUT)

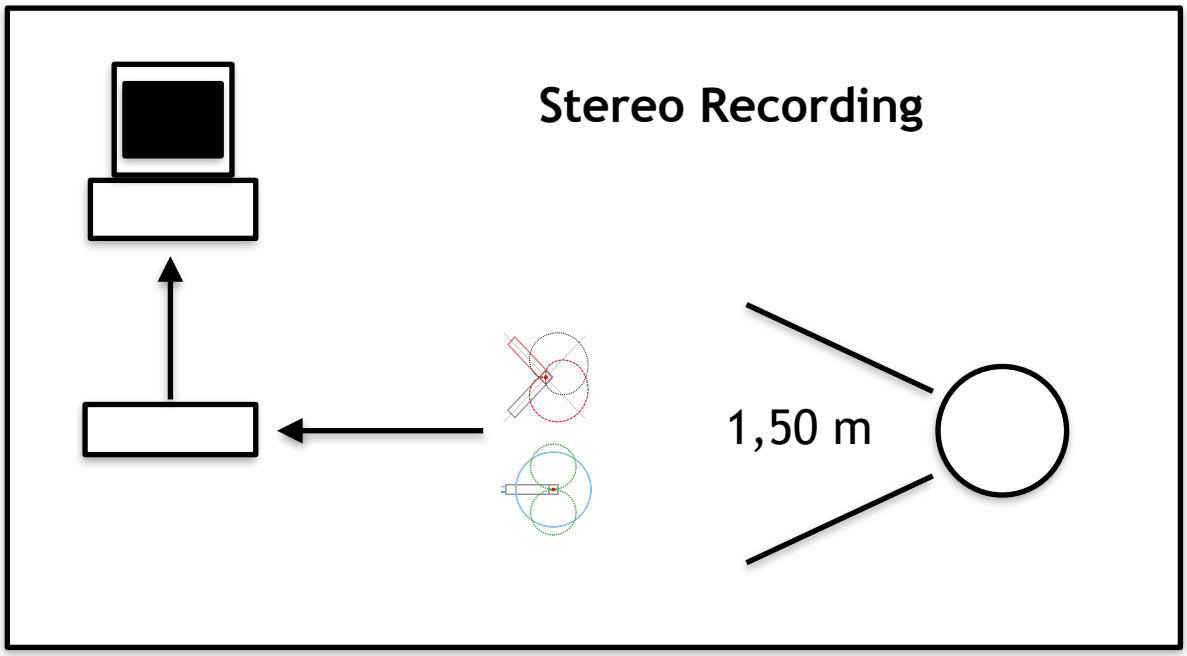


Connect the two XLR cables to the audio interface.

Turn the phantom power ON.

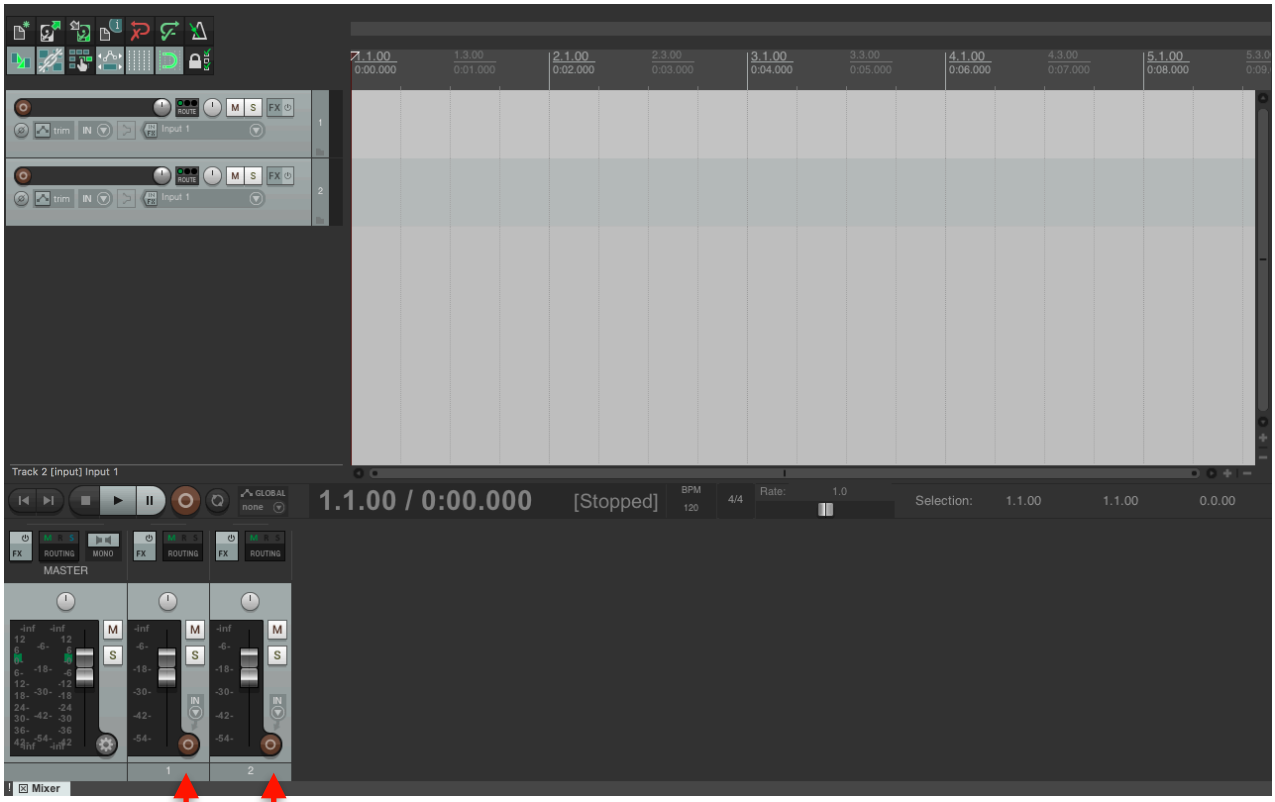
Distances

Each instrument and each player are different, therefore there is not a perfect setting that will work in every situation. The player should record a few takes in order to discover the ideal distance between the microphone and the double bass. My suggestion is to start with a 1,50 meter. The avoidance of proximity effect should be the first aspect to take in consideration.



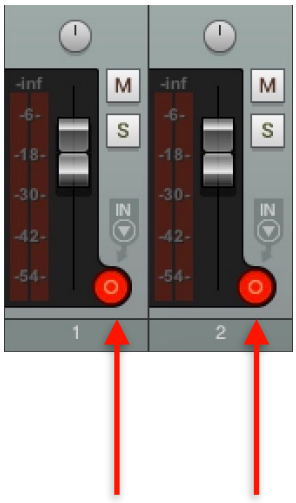
DAW configuration

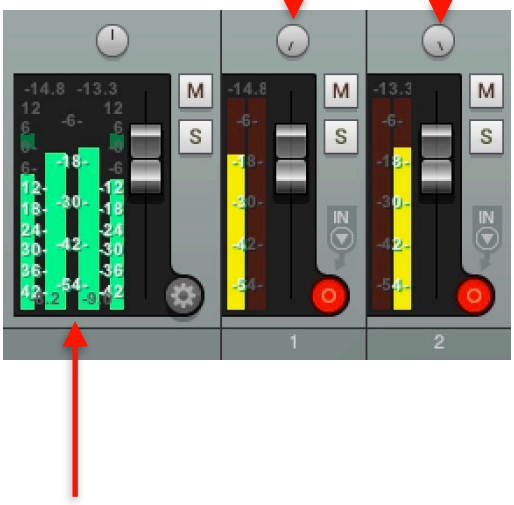
For this example, I will be using a digital audio workstation called REAPER.



Pan on channel to left and the other to the right

Two tracks should be open (on to each microphone)





Arm the recording

The loudest passage shouldn't go above 0 Db

Conclusions and afterthoughts

Regarding this particular experiment making double bass homemade recordings, I have three aspects that I can point out as conclusions:

- 'The further the better'- Although this affirmation is very subjective, all my experiments have shown better results when microphones were place further away from the double bass. As I mentioned before on this paper, this research was about the double bass in solo context and about capturing the sound of the instrument without sound editing. Therefore, close miking might be a good option for a studio recording where the sound can be edited afterwards;

- The different repertoire - In the beginning of this research, I have considered the different repertoire as a relevant factor for my experiences. In the end, it didn't make so much difference. In each recording, the type of sound that I was looking for didn't have any influence concerning the repertoire performed;

- The low budget equipment - Top quality equipment and a room acoustically well prepared will always make a difference in the end result of a recording. I can conclude, though that is also possible to achieve a good result in a homemade recording by using low budget equipment in a proper way. It was not my goal to compare top and low budget equipment but to use it in a way that the end results can improve significantly.

After a year working on this research, my first conclusion is that this was just the beginning of a long and exciting journey. Throughout the experiments I have made, I can affirm that the results of a recording using low budget equipment can significantly increase when taking a few aspects into consideration. The XY and MS stereo settings, turned out to be the most efficient recording techniques for the double bass in different rooms. The proximity effect was the microphone characteristic that provided me with most information to work on. After exploring and working around it, I realized that the further I placed the microphones from the sound source, the better results I had, hence the common saying "the further the better".

My fascination for the recording process, recording studios and how much I want this to be part of my career become even more clear to me. It is my aim to continue investing time in the double bass recording techniques by further experiments and research. My next step is to discover more about the double bass recording in a studio context. I consider this research as being the first step in accomplishing my aim. I hope to pursue my interest in recording in a professional direction in the near future.

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Websources:

- Shure, *Microphone Techniques for recording (*www.shure.com);
- DPA Microphones, *Mic University (*www.dpamicrophones.com);
- Neumann, *Homestudio – Microphone basics (*www.neumann.com);
- Knut Guetler, *Knut's Acoustics (*www.knutsacoustics.com*);*
- Musikhaus Thomann (www.thomann.de*);*
- Focusrite (www.focusrite.com).

Software:

- Logic Pro (http://www.apple.com/logic-pro/);
- REAPER (http://www.reaper.fm/).