HOME STUDIO ANALYSIS

Nastya

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In cooperation with Black Hole Acoustics

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INTRODUCTION

Hi Nastya, congratulations for taking this crucial step in your mixing and production career. With the help of the information you submitted we were able to calculate the issues in your room and devise a personalized solution that will improve your listening and producing experience by magnitudes.

As passionate sound engineers we understand how great it is to buy new equipment - nothing beats the unpacking experience of a new audio interface, or switching on those great new speakers for the first time. However, we are sure that it happened to you before that no matter what new gear or plug in you purchase, your mixes still end up sounding flat or just won't translate well when you play them back on other systems.

Gear manufacturers are withholding a very important truth: your work will only be as good as the room you are working in. Your recording and mixing room puts a permanent stamp on anything you do, therefore it is crucial to address the acoustics of the environment you work in. In reality we believe that this should be taken care of at the same time you buy your first set of speakers. We promise that through our consultation and treatment suggestions your work will improve immediately.

Our highly experienced acousticians have analyzed your room and have created an acoustics improvement plan unique to your room. Your personalized document includes visual aids to support your build process. What's best, this treatment will work with your existing setup and will result in a bigger improvement in your work than any new plug in or piece of equipment could provide.

ROOM ANALYSIS

In this section an analysis will be made of your room to gain a fundamental understanding of how sound energy is being distributed. This will help us to devise targeted treatment for your specific needs.

When looking at the pictures and dimensions of your room, it looks like there are a few things that can be done to improve your acoustics. As you mentioned, your goal is not only to have a good sounding place to work in, but also to reduce the sound levels exiting the room. These are two different subjects: acoustic TREATMENT and acoustic INSULATION. Fortunately, if sound is being absorbed in your room with acoustic treatment, the sound power levels will also be reduced to some extent, as acoustic energy will be converted into heat in the absorbers. This means that just through treatment, less sound will leave your room.

To accomplish good listening and lower levels, we will take the following approach: install as much absorption as possible to make the room sound nice, while also preserving aesthetics.

Your room has very good dimensions, so it is possible to create a great sounding space. Some adjustments will be necessary, and we will show these in 3D renderings so they are easy to follow.

YOUR SCHRODER FREQUENCY

The Schroder Frequency is a dividing line separating two types of sound energy that exist in our listening rooms. Under the line, sound behaves like waves and above it, like rays. This is important to establish, because both types of energy will need different treatment. The Schroeder frequency is unique to every room and is calculated using formulae based on the dimensions of the room.

240Hz

Based on the details you gave us your Schroeder frequency is 240 HZ. This is within the normal range and means that you will have the "usual" room mode issues to deal with, and we can use relatively simple methods to improve the acoustics.

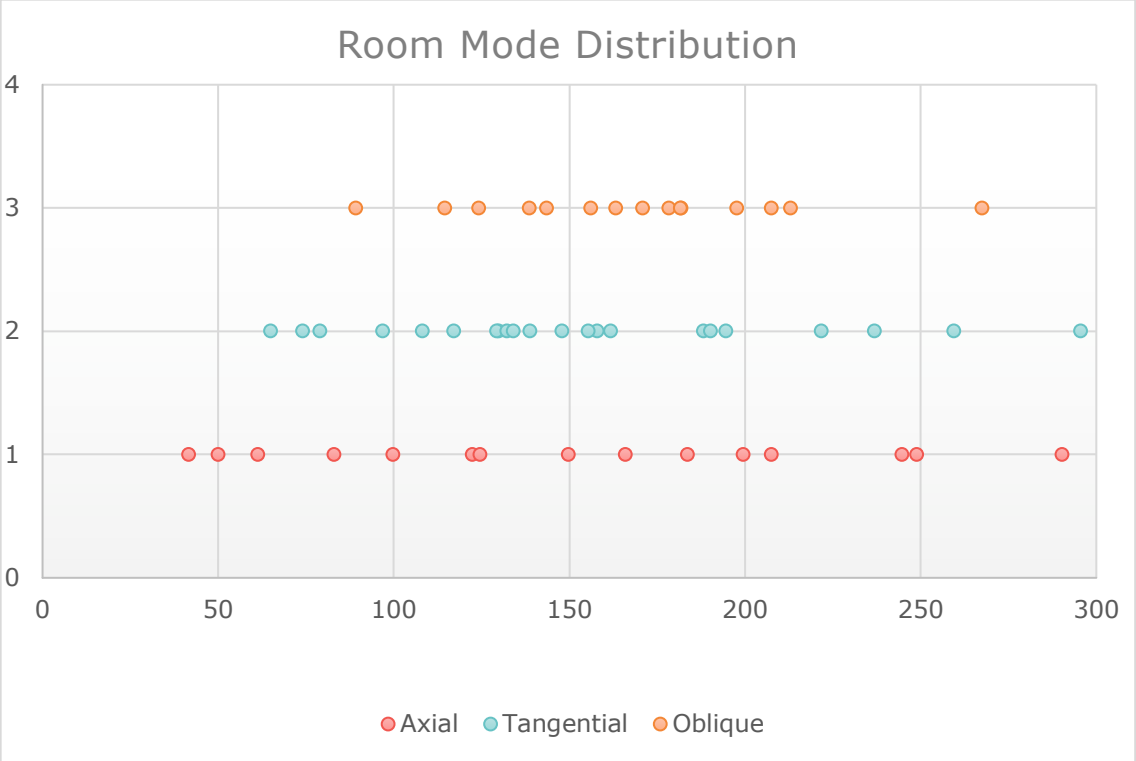
ROOM MODES

Room modes occur when the length of a sound wave is in a mathematical relation to the distance between two parallel surfaces of a room. They are extremely difficult to treat and can have a very big influence on how you hear your music coming from your speakers. They are responsible for extreme dips and boosts in the frequency spectrum and make judging your mix very difficult.

Once you have speakers, you can try this experiment: set an oscillator in your DAW to a 166Hz Sine Wave, which is one of your most dominant room modes. Make sure it comes out of your speakers at a decent volume and start walking around your room. You should notice that the tone becomes louder and quieter in different positions and might even

completely disappear if the modal cancellation is perfect. Imagine the effect this can have on your mixing!

Using mathematics, the room modes can be calculated. The following table shows the distribution of room modes in your listening environment:



The axial room modes are the strongest ones and will be very hard to treat below 150Hz. However, the tangential and oblique modes will all but disappear after treatment.

EARLY REFLECTIONS

Early reflections are the first reflections arriving to your ears after the direct sound coming from your speakers. These reflections define the acoustic character of your room and are the defining factor when it comes to perceiving depth and stereo imaging, therefore it is essential to treat them properly.

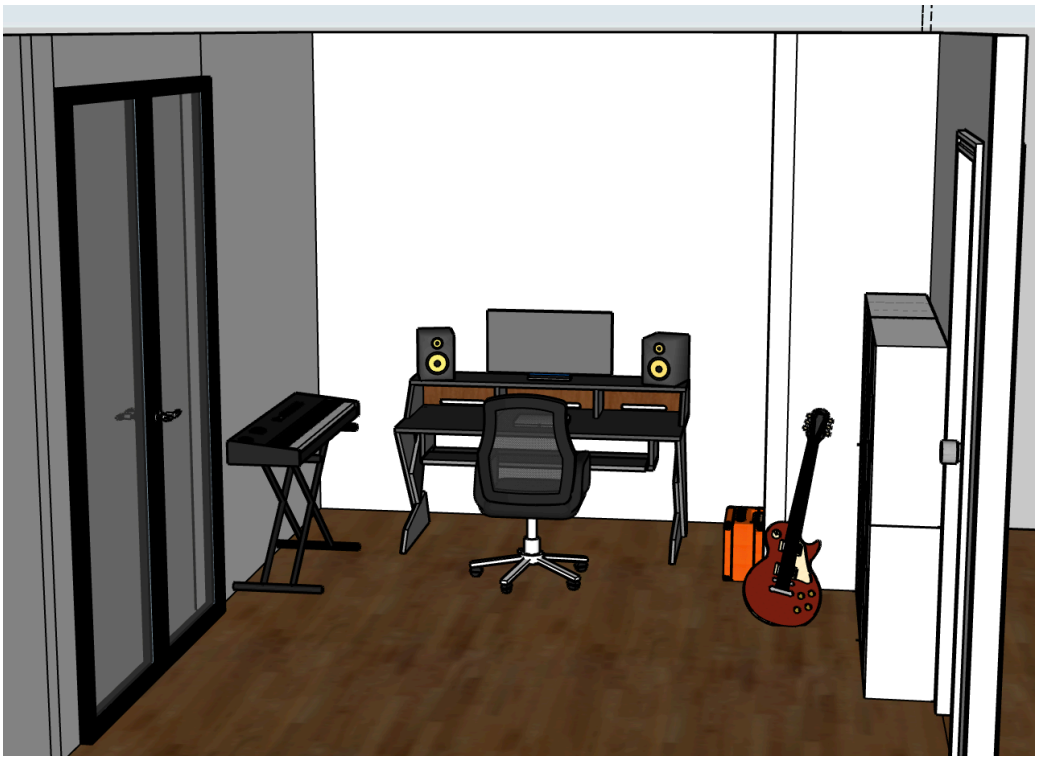
These early reflections can also build up and become flutter echoes and even develop into an audible reverb. Especially flutter echoes can be very annoying and damaging, so they have to be eliminated at the listening position as much as possible.

Here is another experiment: Take your microphone and record some singing (or any acoustic instrument) in your room, then in your living room, then bathroom. You will hear how dramatically the sound changes even though the microphone and instrument were the same. These are largely the workings of early reflections. They are like a stamp on your recording and influence your listening/monitoring just the same.

Fortunately, these are very easy to treat using absorbers and diffusers. Using the pictures of your room and the dimensions you have sent us we are able to estimate the characteristic sound of your room and suggest proper treatment options.

Looking at your room in the 3D model below it can be said that basically every surface in your room generates strong early reflections in your case. Since the surfaces are also close together, these echoes can build up quickly. Interestingly, there will be more reflections coming from your right side than your left because of the proximity of the wall.

You will also get strong reflections from in front of, and behind of you. So combat some of this, we suggest that you rearrange your furniture to the following layout:



With this layout, reflections from behind will be much reduced due to the longer distance and we can treat the left and right sides equally for good stereo imaging once you have speakers.

The keyboard and guitars can go on either side, the most important is that your desk/setup is central/symmetrical to your front wall.

REVERBERATION AND FLUTTER ECHOES

Reverberation is yet another stamp on your recordings and your listening experience. Since your room has no treatment yet, this will be quite audible especially in the 500Hz-1kHz range. Our calculations suggest that your RT is a quite audible 0.8 seconds.

$$RT60_{(weighted)} = 0.8s$$

This is to be expected, but not really ideal. You want reverberation below 0.4 seconds. Luckily this will change completely once we have the treatment in place.

SPEAKER TO ROOM RATIO

The size of a room plays an important role on how sound energy is being distributed. Especially the low frequencies will change dramatically when going from a small room into a large room. Therefore, it is important to consider the size of your speakers compared to your room.

To understand the importance of speaker/room ratio, imagine taking your speakers and placing them into a huge concert hall. While you do

hear adequate low end in your own room, you would barely notice any in a large hall. This is because the proximity of walls in your room actually boosts the low frequency energy in your room by up to 9dB. Having speakers that are too big - relative to your room - will lead to excess low frequency energy at your listening position. This can lead to a thin sounding mix, because you try to compensate for this with EQ. The opposite is true as well: having speakers that are too small will lead to mixes that are too boomy, because you'll end up compensating for the lack of low end.

Based on the details you have given us we recommend that you buy speakers with following important characteristics:

A: They should definitely be front ported, or not ported at all. Due to the proximity of your front wall, you can't have rear ported speakers as they will create a mess in your low end

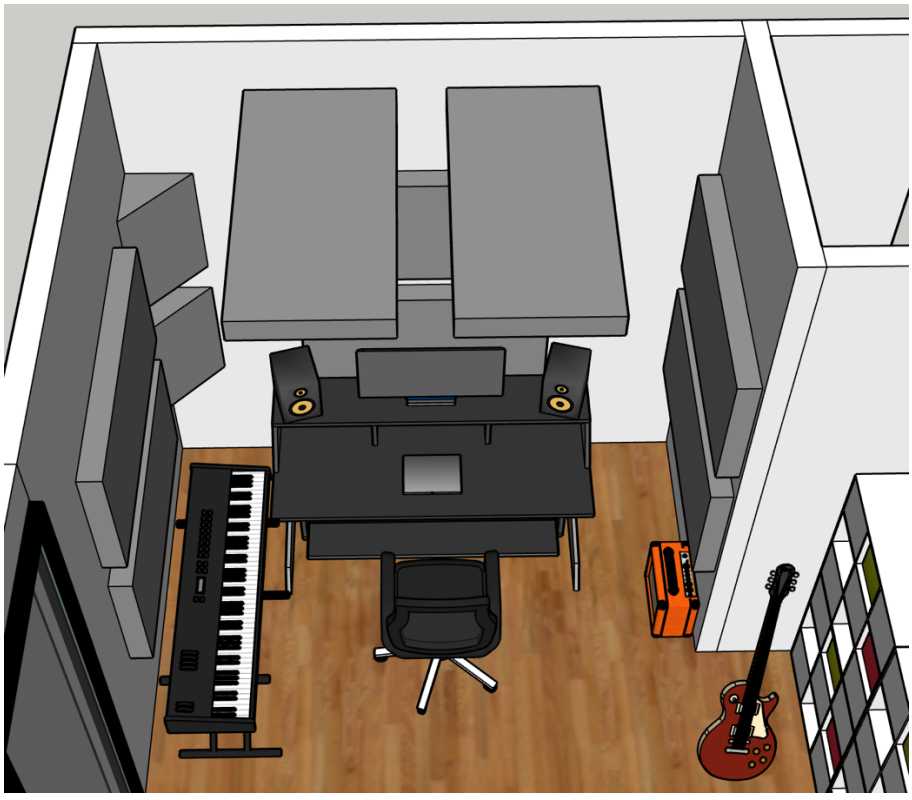
B: The speaker size should be between 5"-7". We will recommend you some suitable speakers in the later sections.

TREATMENT SUGGESTIONS

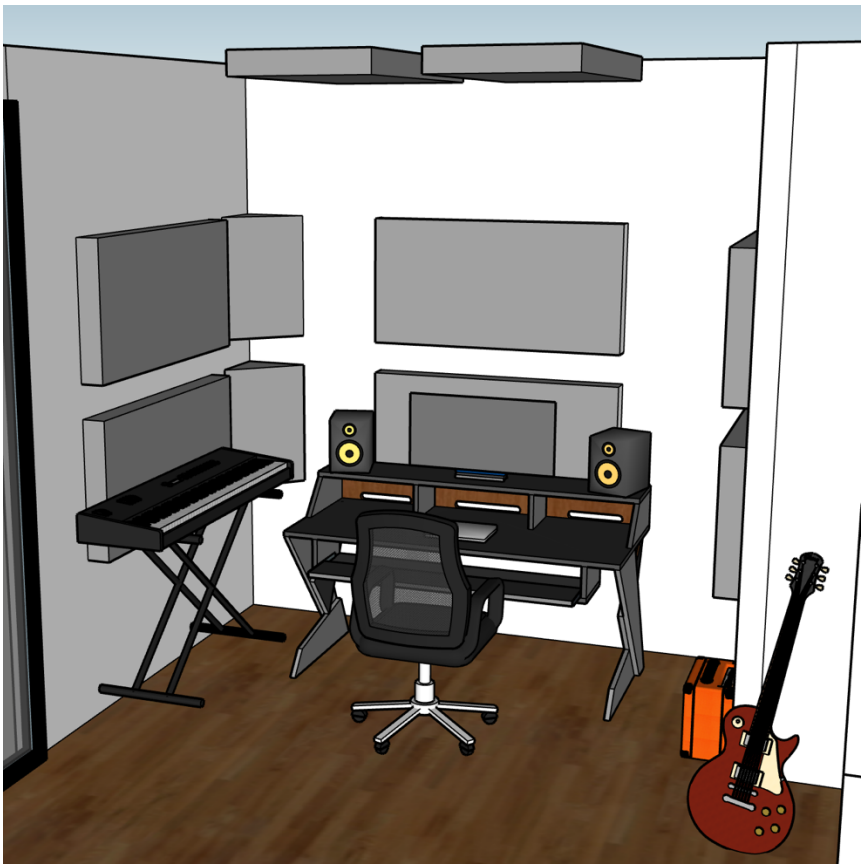
Once the room has been rearranged, we can start adding some treatment. The challenges are to reduce your RT, create a good recording space and lower the SPL exiting the room.

PLACING TREATMENT IN YOUR ROOM

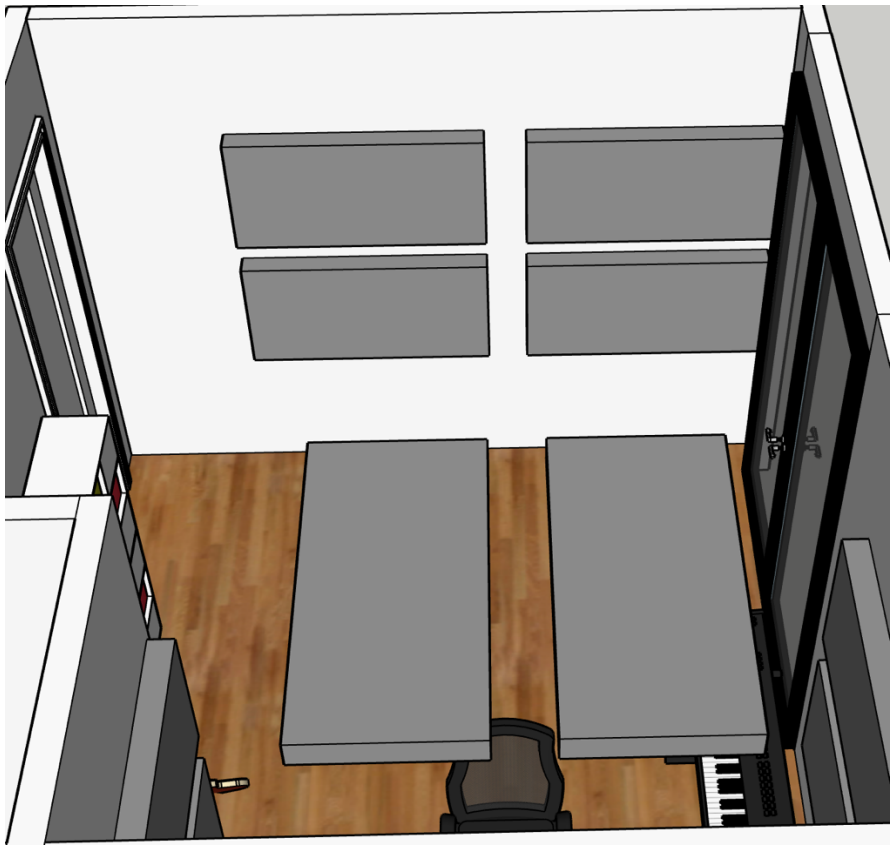
Following 3D renderings show your room with our suggested treatment. As you can see, we used absorption to treat your early reflections, reverberation and overall sound pressure levels.



The absorbers on every surface are strategically placed to reduce the early reflections and reverberation and also create a great stereo listening experience once you have your speakers.



The absorbers in the corner will manage some of your room modes while further reducing reflections, contributing to an even better listening experience. While we highly recommend you to install as many of these corner modules as possible, they are the last on the priority list and you can just keep adding them over time as your budget allows. We will make recommendations of which products to purchase. There is no room on your left side for these modules, but the normal panels will extend into the corner so they will do some of the work.

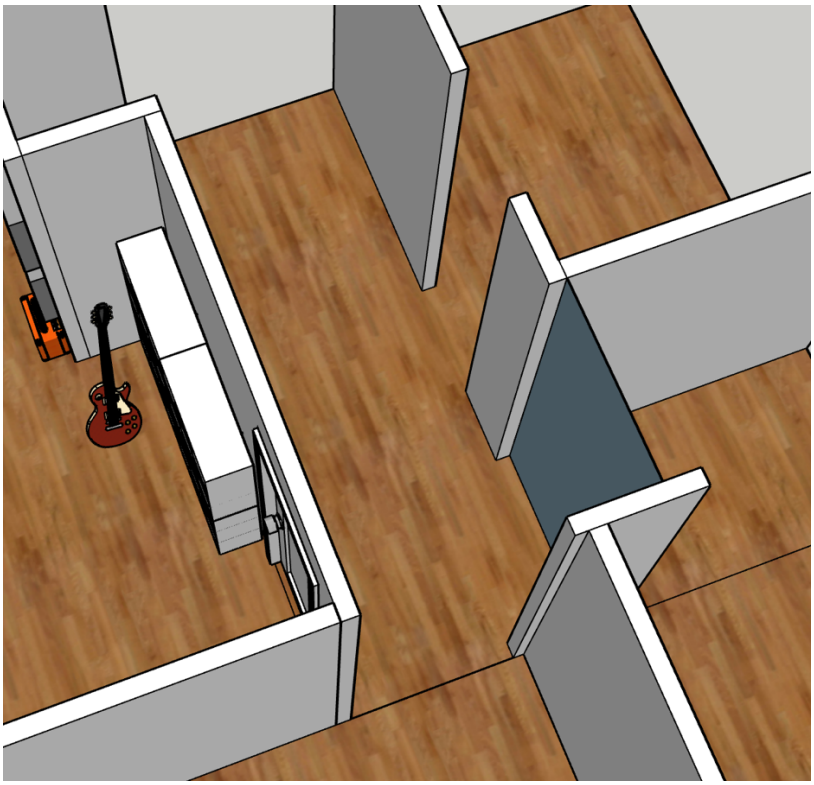


Very important: the back wall. 4 panels on the back wall will further reduce reverb and early reflections and will contribute a lot to a good recording environment. These are in 2nd place of the priority list so we recommend you to install them as soon as you have the budget or can build them. Nr.1 are the panels in your front, at the listening position.

One very effective, yet simple addition would be a good rug under your seat. A 2m*3m carpet, centered under your listening position, will make the room seem much quieter as well. More is better, so feel free to experiment with size and placement. We have included a recommendation in the picture below:

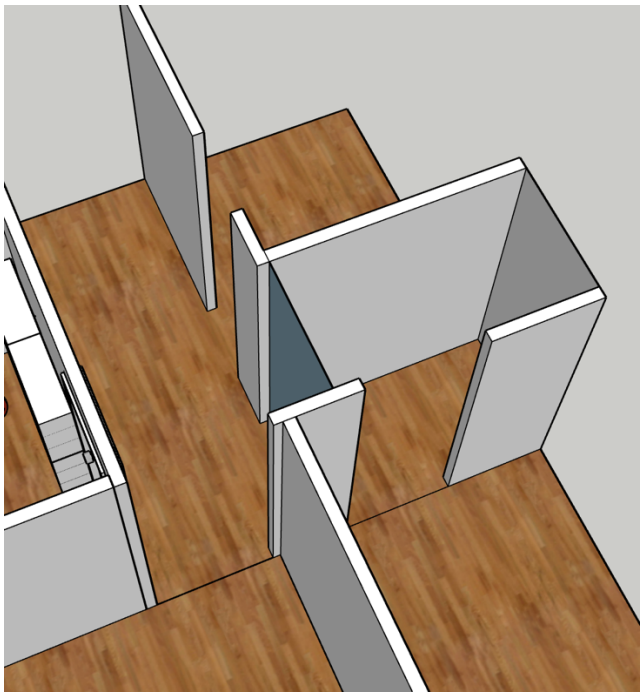
We believe this carpet will also improve your comfort. You mentioned a sofa for this room. We think it can go to the back wall later, which will be a great 2nd listening position to double check your work. Also, if you have a big enough screen, you can enjoy movies with your good acoustics and speakers.

To further reduce noise entering the living room/kitchen area, you should go ahead with using the acoustic curtains that you suggested. In the picture below we have a placement suggestion that we believe will work best, whilst not being completely in the way either.



Leaving space between sound source and absorber can enhance the absorbers efficiency, as air itself contributes to reducing the sound power. In this case, your room is the source and we want to make it quieter. If you work with your door closed, your primarily sound source will be your door and the walls around it. So it makes no sense to place absorbers on them as the sound will just transmit through structural vibration. Having a gap between your door and the curtain will increase the efficiency of your curtain and support the reduction of airborne noise. However, be aware that for the curtain to work best, it should cover the entire width and height of the hallway. Gaps will reduce it's efficiency by magnitudes. This placement is also practical because you can still easily go to the bathroom and storage room from your kitchen.

If this one curtain is not enough, you can install a second one at the entry to your kitchen, but this will of course make it more cumbersome to go to the storage/bath room.



All in all, from a technical perspective, we would install treatment in three steps:

1: Rug, panels at your listening position, and curtain Nr.1.

2: Panels in the back of your room,

3: Corner treatment, 2nd curtain.

From a practical perspective, considering that you don't have speakers at the moment, we can change this to work more on your recording space and sound leakage first:

1: Rug, curtain Nr.1 and panels on the walls, but not ceiling

2: Curtain Nr.2 (if necessary), ceiling panels

3: Speakers, corner treatment.

PRODUCT RECOMMENDATIONS

Here we will recommend some products to make it all possible. If you can build your own panels, that will save you a lot of money and will get you better results too.

If you build your own, we recommend 45kg/m^3 RockWool, in 10cm thick slabs. That will give you amazing results. We use 10-20cm in most of our builds and the results are always great. There are plenty of How To guides on the internet for this.

Products to purchase:

Curtain: The Hofa ISO3 curtain will do a great job whilst also being relatively affordable. I did a quick check, and one curtain will cost you around €215.

Panels: Hofa also has great panels, the Ceiling Sail can be used and also the wall sails. Thomann has some good offerings from EQ Acoustics (link) which are the size we recommend and also sufficiently thick. But again, since these are so expensive to purchase, it might even be cheaper to purchase the rockwool, wood and fabric necessary to build your own, and hire an handyman for a day to build your panels for you. Especially since you need at least 10 to make a significant difference, we just don't see it justified to spend €1300 on panels which can be built for €300.

Corner Traps: The primary attribute you have to look out for is thickness. Any foam corner module will do a decent job, just make sure

they are at least 30cm thick. We recommend you to have a look on eBay. The t.Acoustic ones are great as well, although pricy.

Speakers: We have a list of speakers with some pros and cons for you:

Neumann KH 80 DSP: These are truly excellent little monitors, which sound much bigger than their size and have a very neutral/balanced tone. This model also has a digital optimization module built in, which will adjust the performance of your speakers to work better with your room. This only works within a limited range of course, so acoustic treatment is still necessary. Also, don't forget to let the speakers re-analyse your room every time you install additional treatment and new furniture. The only con of these speakers is that the bass won't be as big, as they only go down to around 57Hz. However, for most applications, this is still enough. With the DSP you will also get a more accurate low end, which is more important that a large amount of it.

Neumann KH 120: These are also fantastic, they will sound a bit bigger due to the larger cone, but they don't have the DSP function so the good acoustics will have to be developed. However, if you install the panels, we believe these will be great performers in your room.

Adam A7X: These are in the same price range and are also front ported. However, they are completely different beasts and have a specific sound to them which people either love or hate. Personally, we hate them, but they might work well for you.

Focal Alpha 65: These are the cheapest of the bunch and we have personal experience with them. For the price they are amazing, and they fulfill all of your requirements, including the front porting and size. The only downside is that they are a bit bright for our taste, which can give a false impression of your mix. However they are well designed because a lot of the technology inside comes from the higher range of Focal speakers.

If we had to put these in order, we would recommend either the Neumann KH120 or the Focal Alpha 65, depending on your budget. The KH120 would be a great long-term investment. We are a big fan of Neumann speakers (Martin uses the KH310s). The Alpha 65 are great as well and are a good alternative if you don't want to spend more money at the moment. The Neumanns are truly critical monitors, they will make you work a bit harder because you hear EVERYTHING. Martin was really frustrated in the beginning when he bought his KH310s, because they revealed every little mistake. The Focals are a bit more forgiving, but maybe a bit more fun to use. We definitely recommend you to test the speakers first, just remember to stay away from back ported designs and speakers that are too large. Also, we recommend you to stay away from 'budget' manufacturers, which don't have high end products in their sortiment such as KRK, Yamaha, M-Audio, Presonus, Fostex etx. Neumann, Focal, and a few other manufacturers are famous for making very high end monitors and this knowledge and technology trickles down into their more affordable offerings as well.

TREATMENT SUMMARY

To sum things up, we have to state that your room is quite easy to treat because you have enough space with high ceilings. You have good symmetry as well which makes it easy to create a good monitoring position.

The panels will absorb a lot of the reverberation and create a nice dry space where you can record your instruments. The rug would be quite important, as the wooden floor reflects a lot of sound, especially at your listening/recording positions. Sofas are great, because they are essentially bass traps, just make sure you don't buy one made of thick leather, because that will only reflect more sound.

The acoustic curtain will absorb some sound going into the living room. Hopefully there isn't much structure borne sound (sound travelling trough solid walls and ceiling), because that is impossible to get rid of.

The speakers we suggested will make you very happy in the long term as they perform well and make music more fun. We are a big fan of Neumanns, because they make us work harder – which in turn makes us better engineers. Focals are a bit more fun, because they are a bit brighter which makes work in progress sound more finished.

We are excited to see that you took this important step to improve your work. You will not be disappointed with the results. For further consultation don't hesitate to contact Martin at martin@musicianonamission.com. A half hour phone consultation is part of the service, please send an email for an appointment. Happy Mixing!