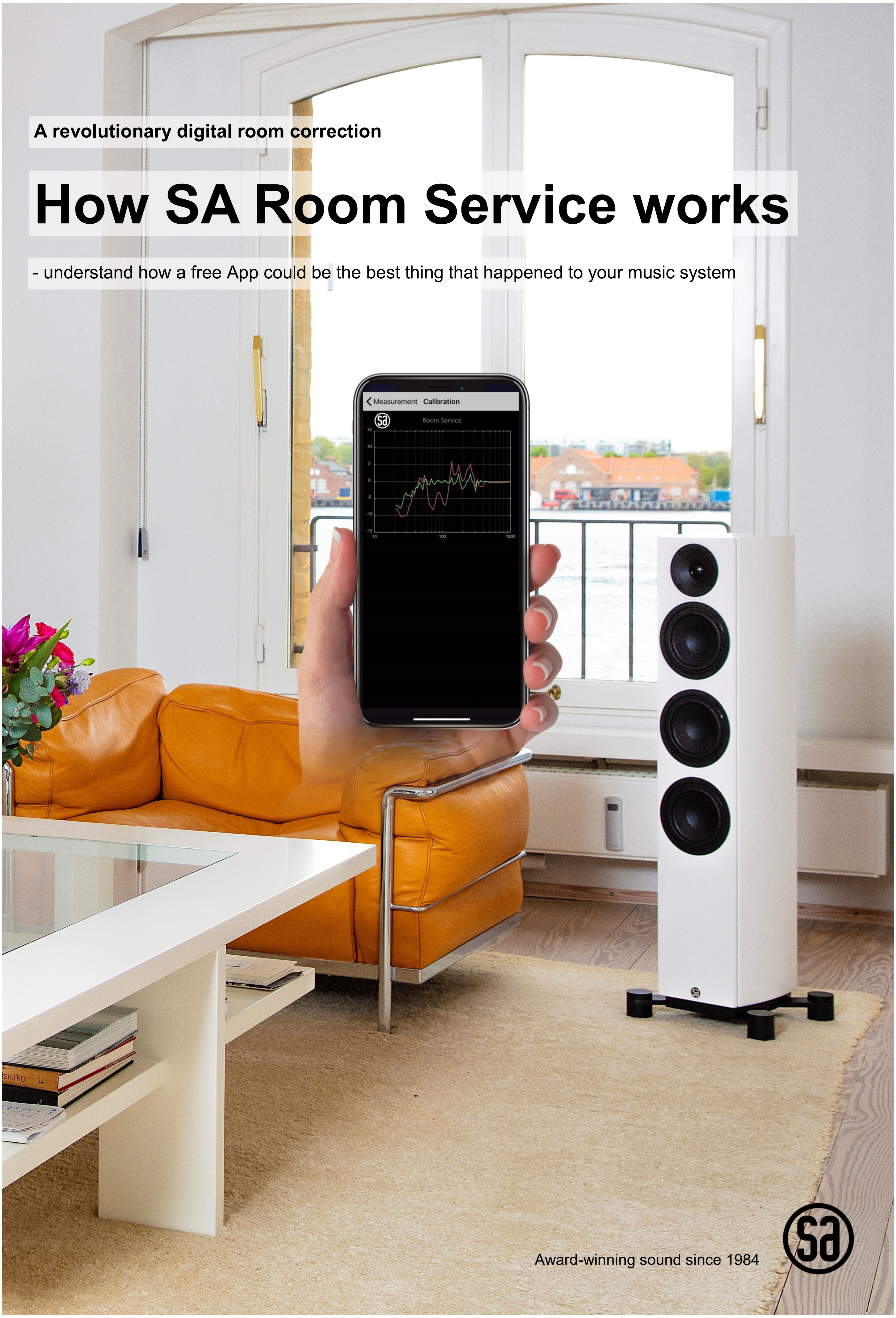
A revolutionary digital room correction

How SA Room Service works

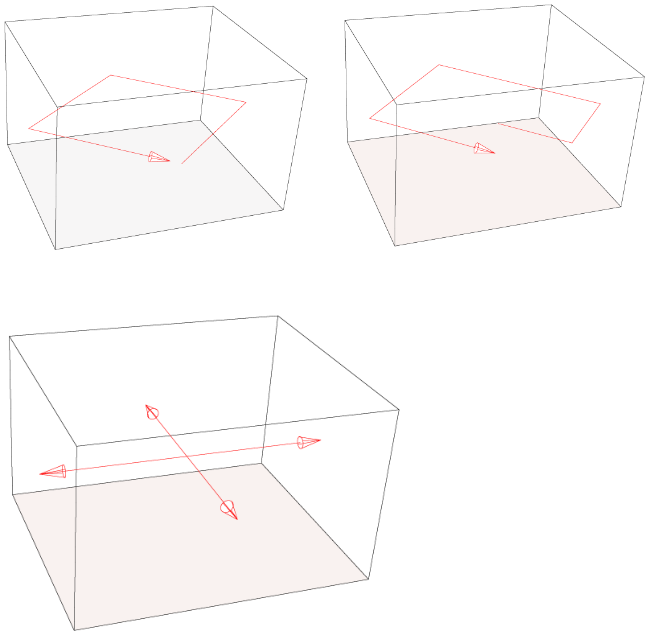
- understand how a free App could be the best thing that happened to your music system



Award-winning sound since 1984

How SA Room Service works

When music is played in a room, the boundaries of the room will cause sound to be reflected at the boundaries which is causing a phenomenon called room modes.

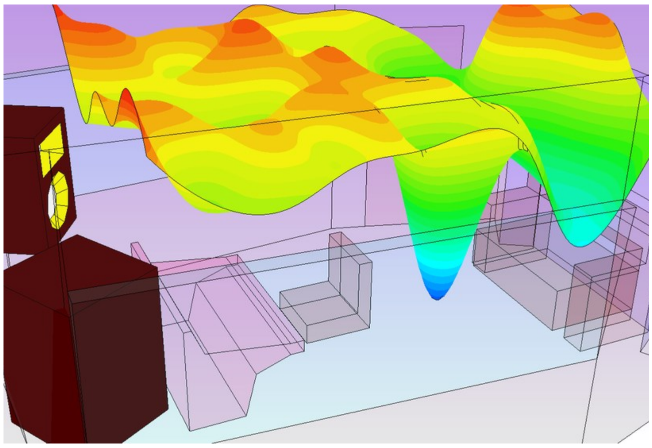


These are resonances appearing between walls, ceilling and floor and even in several directions. They will appear at specific frequencies depending of the dimensions of the room.

These room modes are 3 dimensional, meaning that they will appear differently in the room, depending on where you are located.

Figures on the right show room modes in 1, 2 and 3 dimensions of the room. In theory, there are infinite room mode orders, moving upwards in frequency.

Bass sound is dominated by the acoustics of the room



As you see from this illustration, the sound of a certain frequency in a certain room will appear very differently when walking around in this room. Another thing to be noted is, that when the mode order is increased, the deviation in sound pressure comes gradually closer together, making it difficult to distinguish each mode- and even small changes in distance will cause big change in sound pressure.

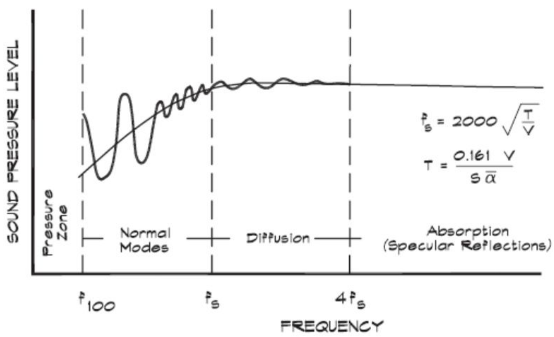
At this point, the room enters what is referred to as the diffuse field of propagation and the room is no longer dominated by well-defined room modes.

There is one big mixture of standing waves in all directions.

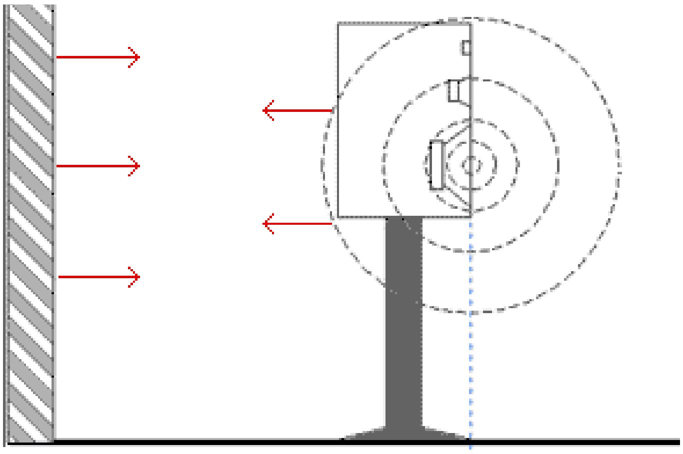
Room correction is performed below the Schröder frequency

Normally, the transition mentioned above takes place around 250-300 Hz. The transition frequency is referred to as the Schröder frequency and is individual for all listening rooms.

It is shown in the figure to the right, how the transition from low modal density happens at Fs and changes into a blur of standing waves: diffusion.



Understanding the boundary effect

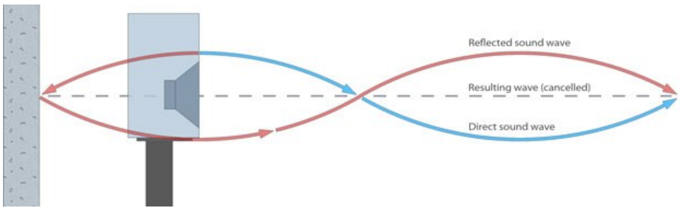


Another acoustic room-related challenge is the boundary effect. It describes what appear when you locate a loudspeaker in front of a boundary.

Many loudspeakers are designed to be linear but the tuning is performed in a free-field situation with no boundaries. When a loudspeaker is placed in front of a boundary, the sound meeting that boundary will be reflected and thrown back to the listener.

This will cause two artefacts: bass boost and interference.

Wall behind loudspeaker interfere with the sound



Since the high frequencies are mainly thrown forward and bass frequencies are distributed all the way around the loudspeaker, the majority of the energy from the loudspeaker meeting the rear wall is low frequencies.

This means that a boundary will cause low frequencies to be reflected and thrown back to the listener, while high frequencies will not.

This will cause an overweight of low-frequency content if the loudspeaker is being moved closer to the boundary.

More boundaries (like corners) will cause this effect even more. This is called the boundary gain effect.

The other thing that happens, when a loudspeaker is moved to a boundary is, that the sound reflected at the boundary will come back to the listener, but now with a latency, compared to the original (non-reflected) sound.

This means that at some frequencies they will cancel each other and at some frequencies they will be added to each other. The boundary causes interference which is not easily predicted.

The SA Room Service solution

The SA Room Service method takes all the previously mentioned effects into consideration when performing the calibration.

When you walk around the room with a microphone–covering all the positions in the room, we can identify each single room mode—and calculate exactly how to intervene with it. We can identify the boundary effect caused by the loudspeaker positioning and the interference caused by the boundary. This method is called continous soundfield sampling.

The benefit of this method is that we have more data available than if we only perform discrete points measurements.

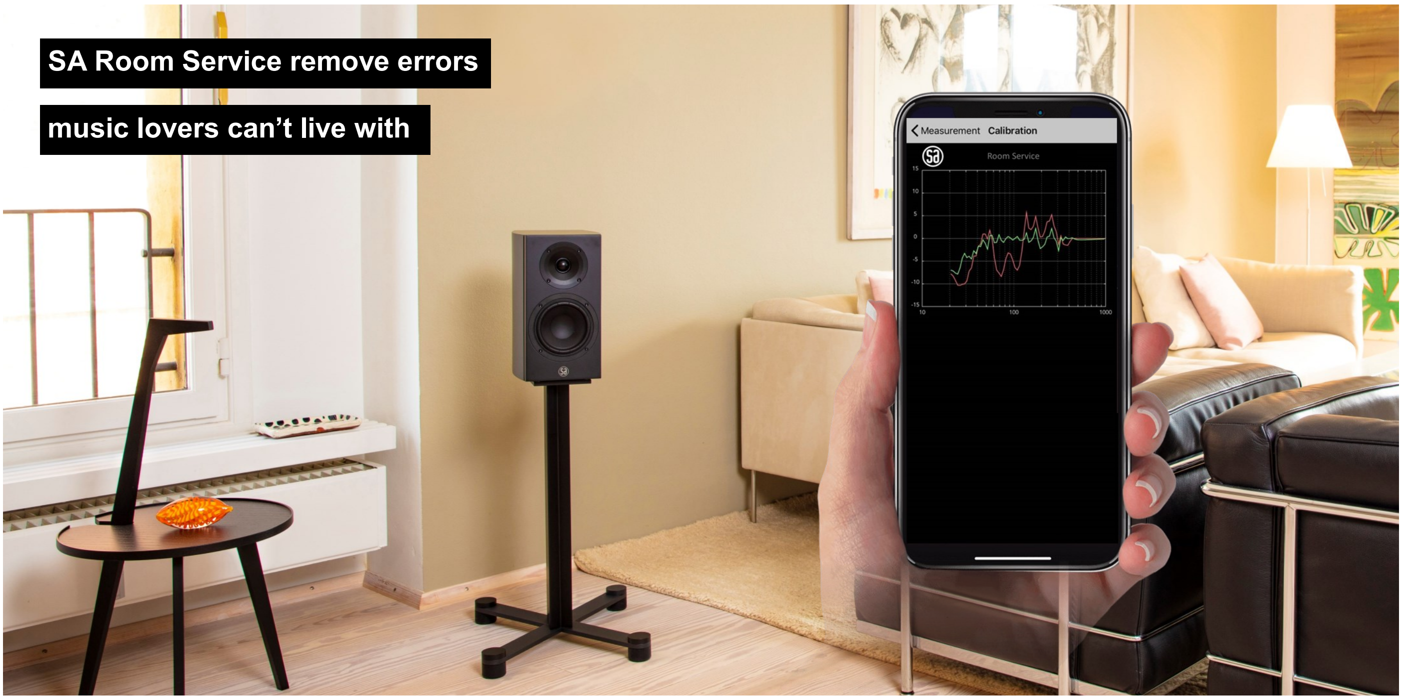
With discrete points, we don’t know if we are in a minimum or maximum of a room mode - and there’s a high risk of making wrong corrections.

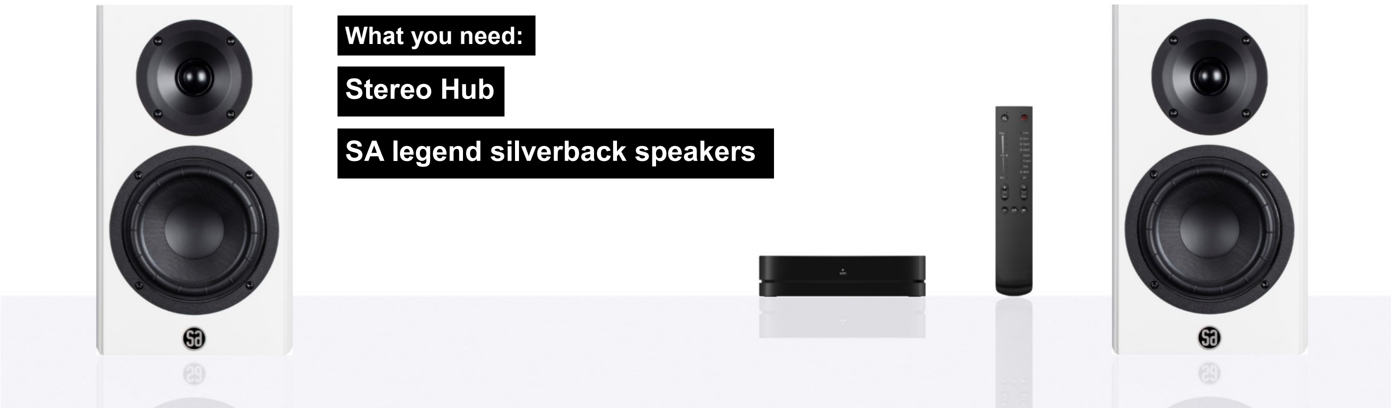
Since the room acoustics only impacts a frequencies below the Schröder frequency, SA Room Service will only correct frequencies below that.

However, we do capture data all the way up to the high-frequency band. This data is used to align the low-frequency output with the high-frequency output.

The corrections at low frequencies are significant, it can be challenging to identify the natural response of the loudspeaker. For this we use the high-frequency part for aligning the two bands perfectly with each other.

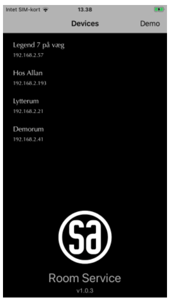
The mathematics and analysis tools used to analyze the measured data is quite heavy. However, the CPU of a smartphone will do the job. There is no need for cloud-service or PCs for this method. The optimazions can be calculated in only a few seconds. Once calculated by the phone, data is transferred and saved in Stereo Hub with no added system latency.

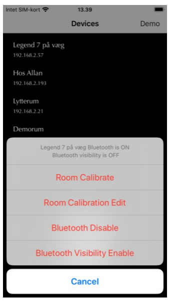


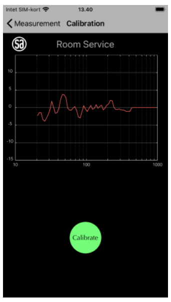


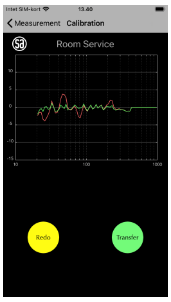
User manual

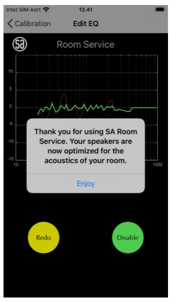
Download System Audio Room Service from AppStore to iPhone











Choose network

Smartphone and Stereo Hub must be on the same Wifi.

Choose Room Cal.

In this window you may also disable/ enable Bluetooth in Stereo Hub

Measure room acoustics

White noise from speakers.

Walk around room with phone for one minute.

Calibrate correction

App calibrate room correction based on acoustic measurement.

Transfer corrected response

Room correction (green) is now saved in Stereo Hub.

Test room correction

Disable/ enable room correction to hear the difference.

Close App.

Enjoy.