Nor848A Acoustic camera

Finding Acoustical Weak Points in Room Dividing Modular Walls

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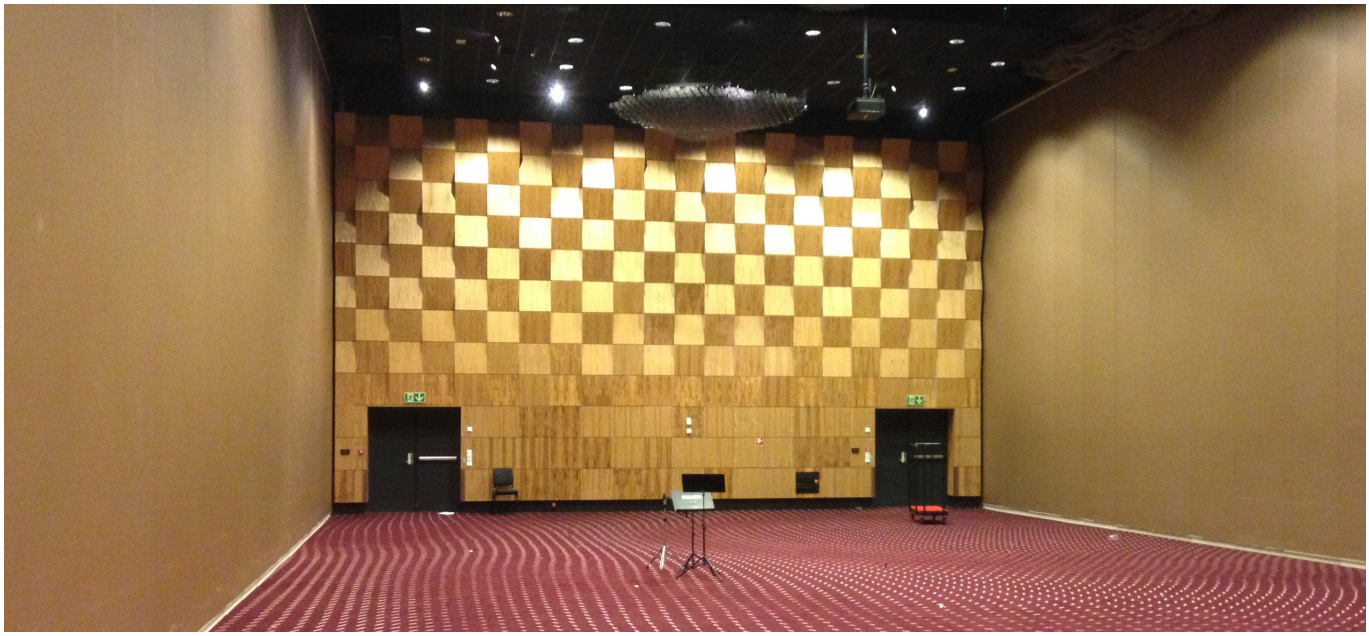


Measurements in a conference hotel in Trondheim, Norway, November 2014

Problem

A conference hotel is using modular walls to divide large halls into several smaller conference rooms. The rooms are divided by modular walls that provide several different opportunities for subdivision and multipurpose use of the large area spaces.

When measuring the sound insulation between adjacent rooms through the modular walls, the resulting value was found to be too low, and noise from one conference room could possibly disturb listeners at adjacent rooms. The dividing modular walls cover large areas, and are as high as 7 meters from bottom to top, which makes intensity measurements with hand held sound level meters difficult. The room dividers could have several weak points, which were not easily identifiable. It was thought that identifying and fixing the weak points in the individual modular walls would help increase the overall sound insulation capabilities of the entire wall element.

Measurements

The measurements were conducted with the Nor848-0.4 40 cm and 128 element acoustic camera. The camera was plugged into an external battery pack for easy transportation and mobility. The measurement procedure consisted of choosing two adjacent rooms divided by a modular wall of interest. One of the rooms was chosen to act as receiving room, where the acoustic camera was positioned. A noise source and omnidirectional loudspeaker generating white noise at high volume was positioned in the source room. The speaker was placed in one of the corners of the room furthest away from the dividing wall, in order to achieve as diffuse source noise field as possible.

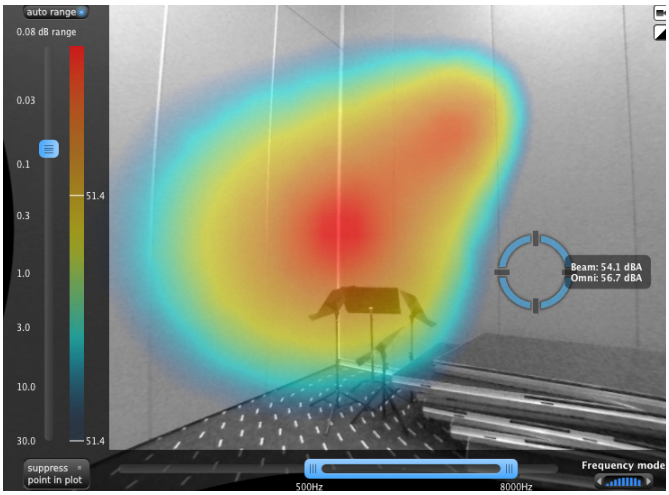
Due to the large size of the modular walls, the camera was pointed to different areas of the walls, and several measurements were made. The individual measurements could then be examined further in post-processing analysis. Due to the source being used at high volume in the sending room, cracks and gaps in the modular walls would appear as small noise sources at specific location on the walls when recording with the acoustic camera in the receiving room.

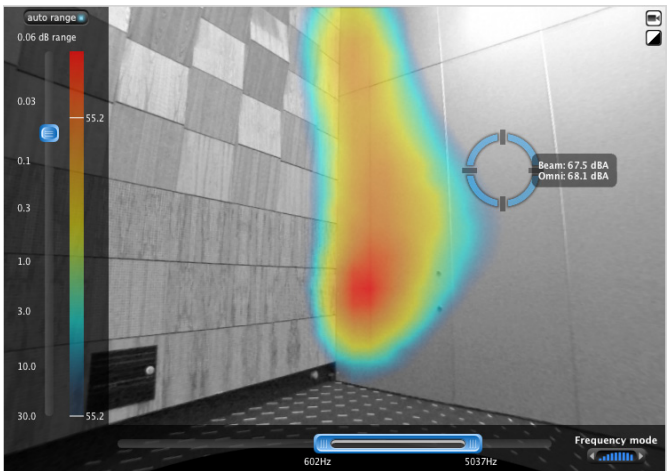
Results

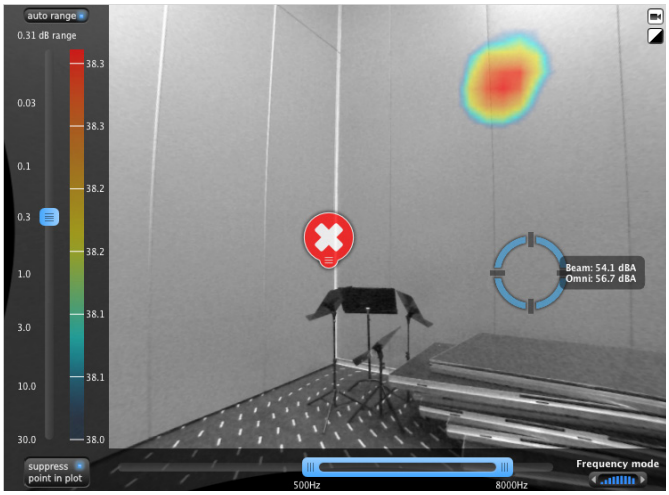
The acoustic camera was able to locate several weak spots on the walls, even though the range where differences could be discovered were for certain areas below 0.05 dB.

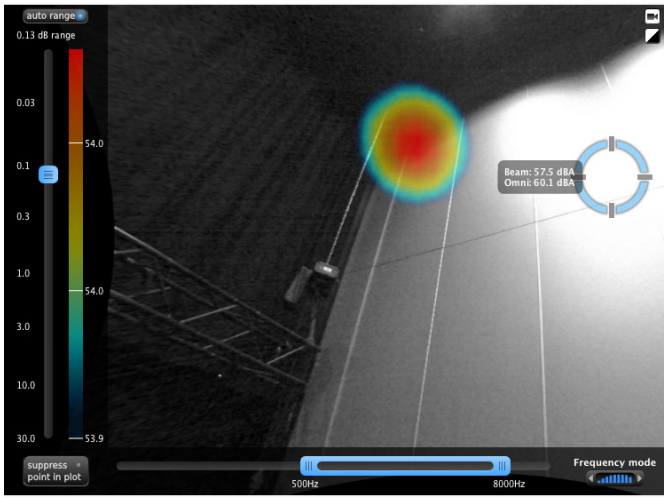
The measurement system's virtual microphone feature was also very helpful during live measurements. With this function you can scan and listen to the desired spots in the image, and also filter the listening function to desired frequency range. This made it possible to scan along edges and hear differences in frequency from different points. A change in frequency may indicate a sound leakage. Also by using the spectrogram function to get a visual representation of the spectrum of frequencies as they varied with time, one could further indicate a leakage at various parts of the walls.

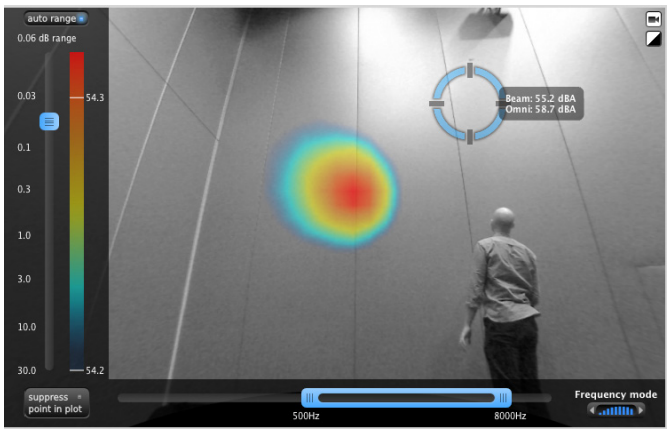
A very useful function is the so called acoustic eraser, which is a functionality that enables source suppression in order to find interesting plotting points. Seen in the images below is a recording of two walls meeting at a corner. The coloring is smeared over a larger area than usual, which may indicate the presence of several sources of roughly equal strength located at close proximity to one another. Or in this case, a weakness or small gap in the walls located so closely that they initially may be interpreted as a single source. Seen in the bottom image, the acoustic eraser is enabled and is seen as a red circle with a white x and placed on a point in the image to suppress a source. By enabling the acoustic eraser, and dragging the point suppressor to the desired location, it was easy to locate the two individual points of interest. Further analysis could be conducted by placing the virtual microphone on the point of interest.











Nor848A Acoustic camera

The Norsonic Nor848A acoustic cameras sets a new standard for acoustical cameras. The large number of microphones eliminates the problems of ghost-spots, compared to traditional acoustical cameras where the relatively low number of microphones increases the side lobe effect, resulting in the so called ghost- spot effect: You “measure” a non-existing source.

The Nor848A software is extremely intuitive and easy to use. Just after a few minutes of training, the user is able to operate the system and do real measurements. Three camera frontends are available, all varying in number of microphone sensors and size, where a larger array size ensures better resolution for lower frequencies: A 0.4 meter array holding 128 microphones, a 1.0 meter array holding 256 microphones and a 1.6 meter array with 384 microphones.

The digital microphone elements are protected behind a disc-shaped carbon fibre enclosure, and a dust and water repellent mesh is protecting the microphones from dust and moisture. The robust and sturdy construction also ensures that all microphones are kept in the correct position – important for field applications. The small distance between the microphones in the inner circle is important for low spatial aliasing at higher frequencies. The large number of microphones also contributes to the wide measurement range and the low self-noise. The signal in the selected direction is based on the weighted average of all microphones and is therefore far below the self-noise from a single microphone.

The system enables the user to perform noise analysis with a clear view of where the different noise sources are located in real time. The system is ready to measure in just a few minutes after entering the site. By moving the cursor in the picture you may analyze and listen to the sound in the selected directions while doing the measurements. This enables the user to identify the problem, whether it is an annoying sound, a leakage or other difficult noise problems in just a fraction of time compared to traditional methods.

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