Nor848A Acoustic camera

Filming Breakout Noise from Café and Concert Venue

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Measurements in bar and bistro Oslo, Norway, March 2016

Problem

A combined bar, bistro and concert venue in the city center has been renovated with a great emphasis on acoustic noise dampening. Nevertheless, the venue is still getting complaints from neighbours close by due to breakout noise from the location, especially during late night concerts. The establishment consists of a bar and bistro on the ground floor, with the concert venue on the floor above. The concert venue has several windows facing the outside street and neighbourhood buildings, and it was desirable to pin point any acoustic weaknesses in these windows. Also it was of interest to see if the wall itself needed additional measures, or if the main source contribution came from the windows alone.

Measurements

The 1.0 m Nor848A-10 with 256 microphones was used for the recordings. The camera was plugged into an

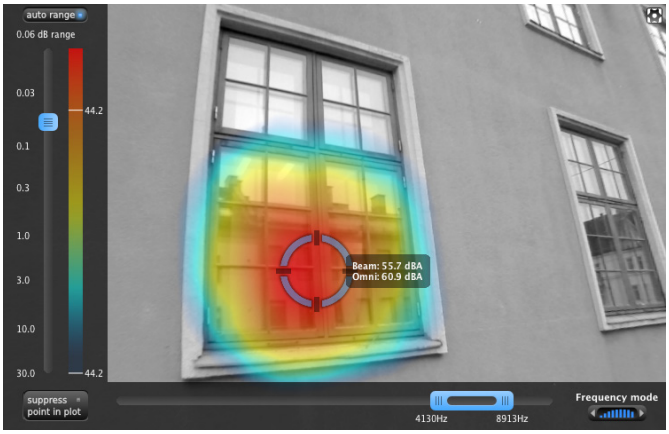
external battery pack for easy transportation and mobility. In addition to measuringing the wall and windows of the concert venue, a wall between the café and a patio area on the ground floor was also of interest.

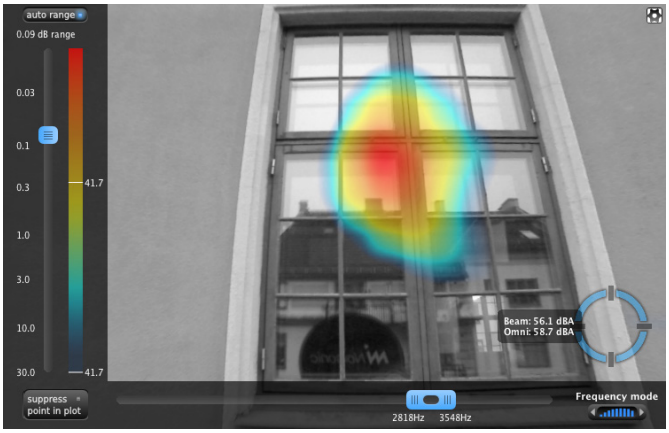
The camera was placed outside pointing at the facade of interest, with the audio system inside of the music venue playing white noise at volumes up to 100 dBA. The room inside would then act as a sending room, and the outside as the receiving room. In order to get close enough to the windows of the concert venue, a truck mounted crane was hired, with both camera and operator around 7 m above ground during measurements.

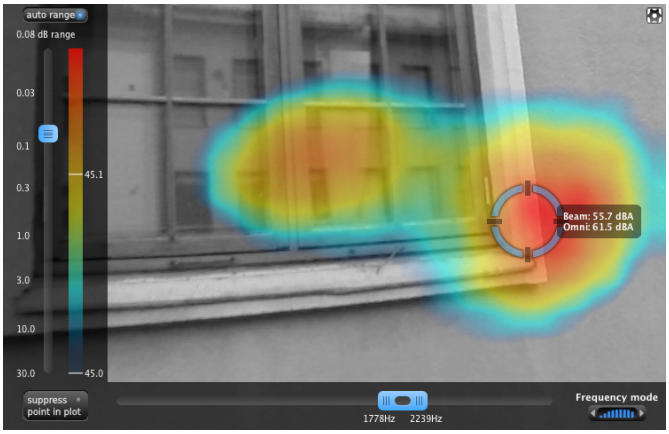
Results

Since the measurements were conducted around noon during a normal weekday, the city traffic was a constant source of background noise, especially during the recordings on the concert venue facade. Cars and trams driving past at regular intervals made it challenging to get a window of opportunity with relative quiet measuring conditions. However since all analysis can be done in post processing, you only needed a window of 5-10 seconds of proper measurement conditions to get the recording needed.

Seen in the pictures below are some of the measurements of the concert venue facade. As can be seen one could quickly rule out that any additional measures had to be taken on the wall itself, as the only sound leakage that could be seen came from the windows only. It was also possible







to zoom in on different areas of interest, either at the site during a measurement, or at a later time in post-processing analysis to further locate weak spots.

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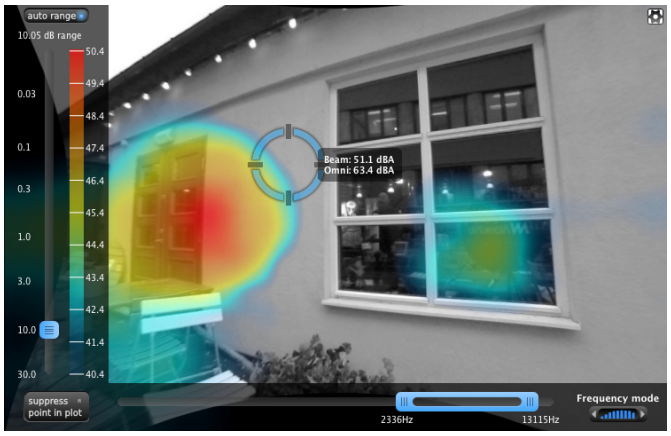
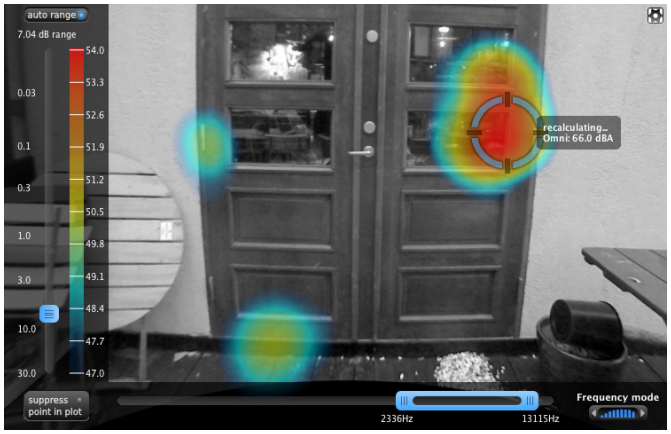
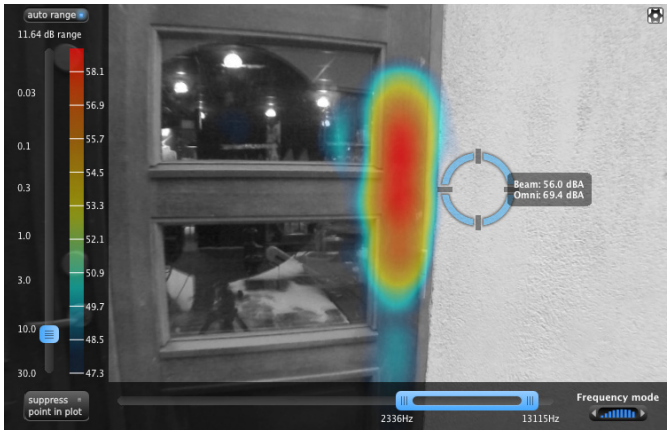
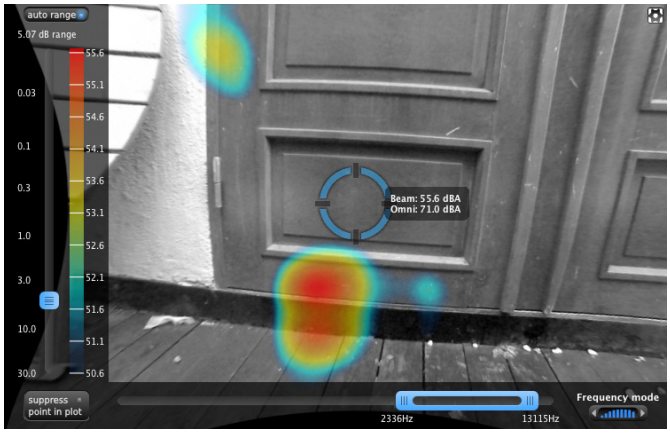
The second measurements were conducted on the patio outside the café on the ground floor. Here the measurement conditions were substantially easier, as the patio was shielded from the city traffic noise. Again the music system of the café emitting white noise was used as source. The wall between the café leading to the patio consists of both a door and several windows. The first step consisted in seeing what made the biggest noise contribution. As seen in the image below, where the dynamic range is set to 10 dB, the door had a noise contribution that was approximately 10 dB higher than the nearest window.



By focusing on the door only it was further possible to locate the exact position of, and zoom in on, those weaknesses as seen in the images below.







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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