

Auditorio Alfredo Kraus

– the Symphony Hall in Las Palmas, Gran Canaria

by Jan Voetmann

Introduction

One of the world's most beautiful symphony halls is the Auditorio Alfredo Kraus in Las Palmas, Gran Canaria, designed by the brilliant Catalan architect, Oscar Tusquets. The most stunning detail in the hall's architecture is maybe the glass wall behind the orchestra stage giving the audience the possibility of enjoying the calm, remote impression of the waves of the Atlantic Ocean together with the musical experience.

The famous German acoustician Lothar Cremer was involved in the early stages of the acoustical design of the hall, but unfortunately he died in 1992. The hall was inaugurated in 1997, and the acoustics were soon found to be problematic. The most pronounced sign was a reverberation time much too long for the stated purpose of the hall, namely that of classical symphonic music. Another problem claimed was the lack of "projection" of sound from the stage to the audience.

A team of Spanish and Danish acoustical consultants was asked to analyse the situation and to come up with adequate solutions in close collaboration with the architects. The solutions should not only take the acoustic perspective into account, but also the issue of making the musicians, both visiting artists and the members of the local orchestras, feel comfortable when performing on the stage, enhancing their means of interacting as "symphonic" musicians, i.e. as "playing in an ensemble". To illustrate one of the problems, one famous opera singer claimed that her voice "did not exceed the edge of the stage". Last but not least, the solutions should be incorporated in the architecture as discreetly as possible.

Design Goals

Interviews with the concert hall management, directors and musicians were carried out, and the acoustical re-design goal agreed upon was triple:

- A new and reduced reverberation time just above 2 seconds at the mid-frequencies, preferably with a small increase towards low frequencies as in "classical" symphony concert halls
- Increased sound "transgression" from the stage to the audience
- Increased "response" or feedback to the musicians on the stage

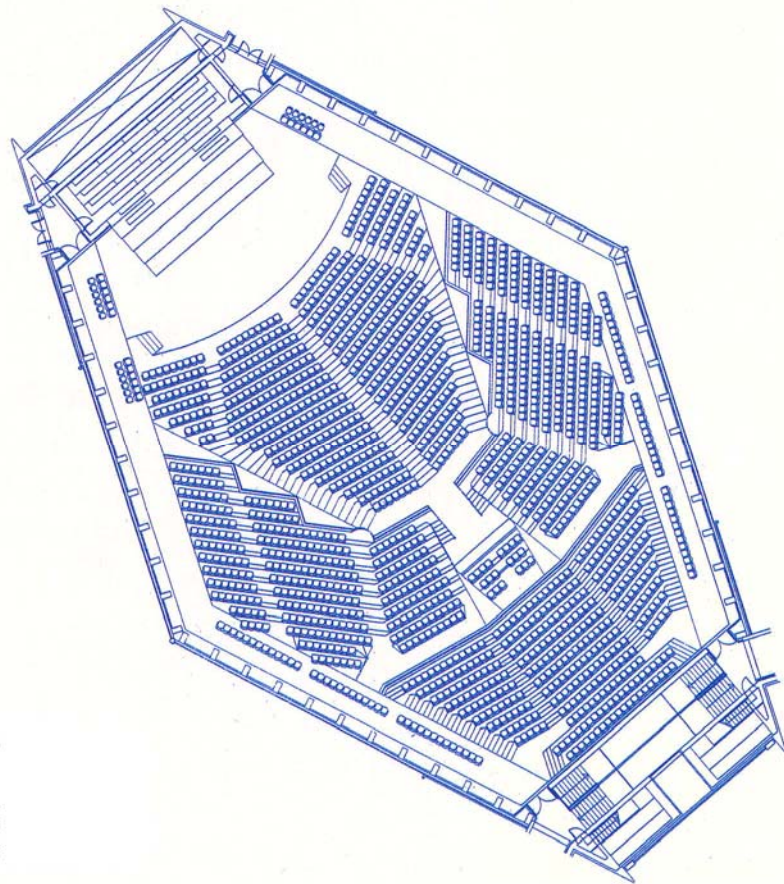
Measurements

The first step in finding a proper solution was to determine the actual reverberation time in the hall. Measurements were made with impulse sound sources (firecrackers), and the room impulse response was recorded on DAT tape recorder for later analysis in the laboratory.

Computer Model

By means of the room acoustic simulation program, ODEON, a computer model of the hall was built. In this model a number of room acoustic parameters were studied, but most important it was possible to study the effect of the original sound reflectors above the stage.

Lothar Cremer's proposed ground plan was the six-sided rhombus. According to him this was the logical modernization of the classical "shoe-box-shaped" concert hall.



Sound-Absorbent Surfaces

Based on the results of the measurements, a new and lower reverberation time for the symphony hall was designed. Surfaces at the edge of the ceiling, at the upper galleries, and at front and back walls were chosen for extra sound absorption; these areas rendered nearly invisible solutions.

Special, newly developed, porous absorbers with reduced high-frequency absorptive properties were used at the edge areas of the ceiling and at the upper galleries, combined with more traditional, mid-frequency absorbers, in the shape of perforated gypsum boards on the front wall above the stage and on the back wall.

By these combinations the reverberation time was reduced from 3.5 seconds (avg. 125-4000 Hz) to 2.2 seconds.

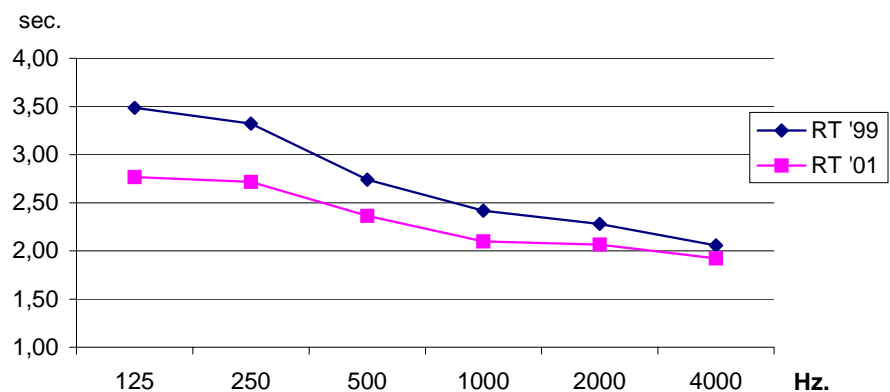


Figure 1

Reverberation time in the hall before and after alterations (empty hall).

Reflector Array

New acoustical theories about reflector arrays, i.e. a large number of medium-sized reflectors, were used, and an array of this kind was designed and optimised. Under the guidance of the acousticians the architects made a visually impressive design of the reflector array with no compromises regarding the overall acoustical quality. The ODEON computer model was used for adjusting the reflectors and investigating the pattern of reflections.

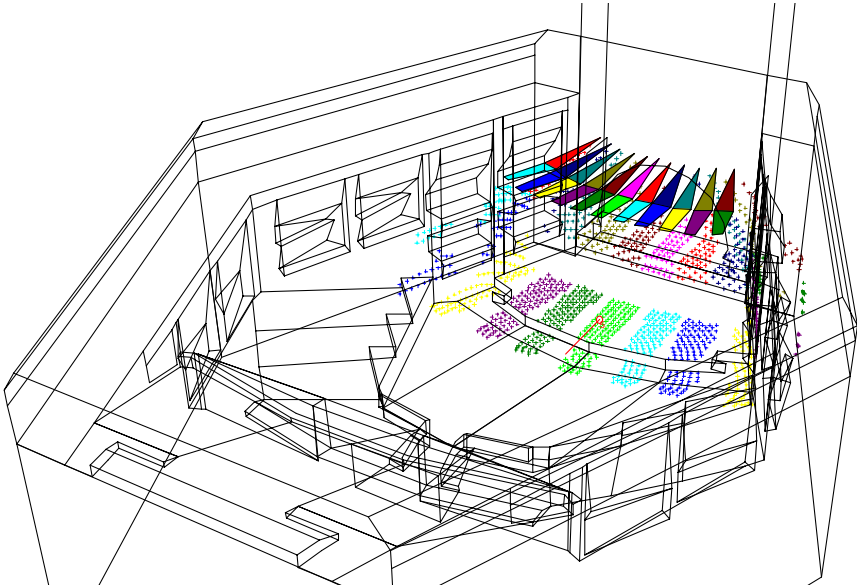


Figure 2
Coverage by reflectors *before* alterations.

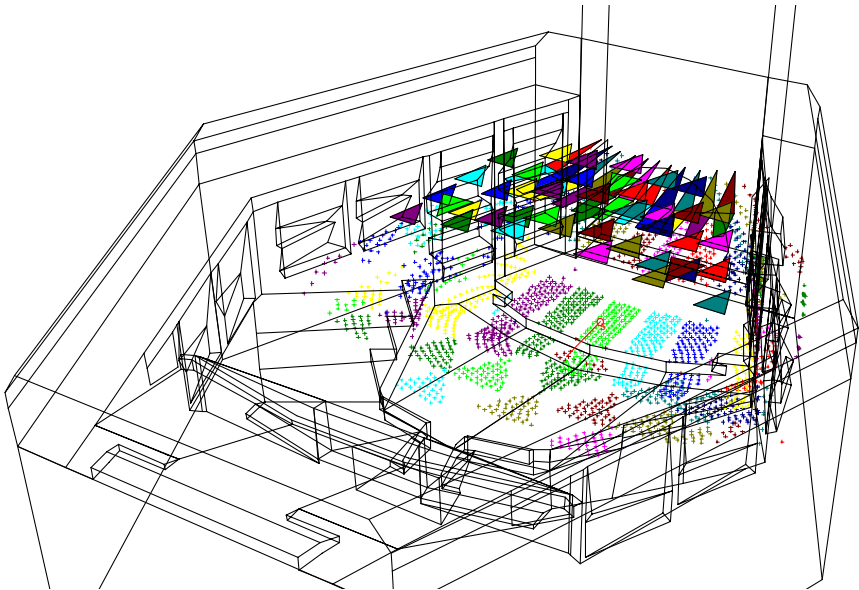


Figure 3
Coverage by reflectors *after* alterations.

Acoustic/Psychological Measures

An important part of the considerations for the improvement of the acoustics of the hall was the intention of making the musicians feel more comfortable on the stage. The stage is very large, and especially minor ensembles talked about feeling a little uneasy. This, of course, is an unacceptable situation as the musicians are then unable to give their best. Several measures were introduced in order to counteract this situation.

- The reflector array was expanded to cover also the stage area.
- Movable diffusing elements were developed, so that musicians and conductor could adjust the acoustical environment on the stage and receive early reflections, thus enhancing ensemble playing, especially in small musical ensembles.
- A movable, visual transparent, microperforated curtain in front of the glass wall behind the stage was proposed. The curtain can be moved up and hidden in the narrow stage tower at the back of the stage. This tower holds other types of curtains (velours, etc.), which are used to control “hard” reflections from the glass back wall according to the actual performance.

Results, Perceived Quality

After re-opening of the symphony hall in the autumn of 2001, the acoustical improvements were received very favourably by the public, the critics, and the musicians. The final evaluation of a concert hall will typically take place over a considerable span of time when more performances have taken place and more orchestras and audience have met each other.

One acoustical problem still remaining is the feeling described as “lack of projection” (translated from Spanish) from singers feeling that their voice is not sufficiently “carried” to the audience. The consultants believe that this is related primarily to the very wide stage and ceiling height. For the time being a special movable reflector, which can be positioned above the soloist, is considered in these special cases.

The Auditorio as a Multipurpose Hall

After the main acoustical problems of the symphony hall had been solved, the management asked for possibilities of converting the hall acoustically in order to use it for modern, electronically amplified music and maybe for congresses. The consultants together with the architect came up with a proposal for a number of textile curtains or “banners” of heavy velvet which could be suspended in front of the side walls.

Different combinations of layers of textile were tested in the laboratory, and ways of easily moving the banners in and out of position were considered. In the spring of 2002 the installation was made consisting of three heavy layers of velvet with a total width of approx. 250 mm hanging down from the upper gallery and moved by a motorized winch. The curtains can be brought into position in approx. 20 minutes more or less by pushing a button.

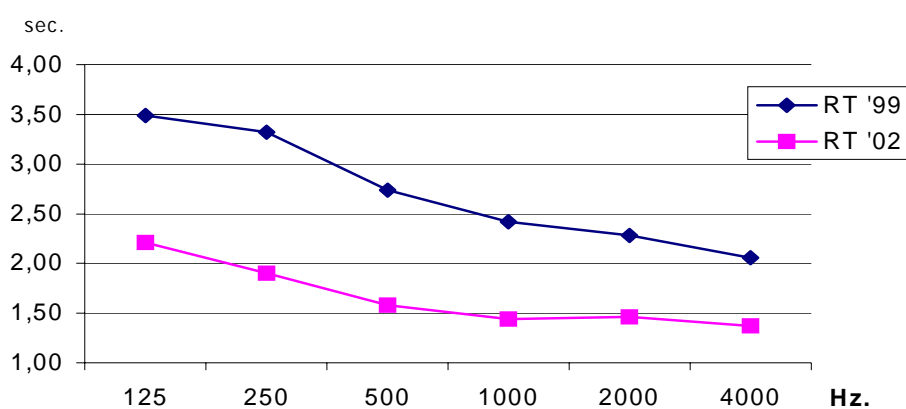


Figure 4
Reverberation time in the hall in the original state and after introduction of curtains (empty hall).

Measurements showed that the reverberation time was now reduced to approx. 1.55 sec. in the mid-frequencies, but a more frequency-dependent reverberation time had to be accepted because of the type of absorber used. A number of acoustically very demanding concerts during the summer of 2002 came out fully satisfactorily.