

TiMax Application Example - “Verdi’s Aida” at “The Royal Albert Hall”

The Premise



Verdi’s Aida, staged in the round at London’s Royal Albert Hall and then at the Manchester, Birmingham and Sheffield arenas follows similar scale productions in the two previous years where TiMax was required for authentic imaging within the vocal reinforcement system.

The company consisted of an A,B and C cast of principles and a chorus of 50. The production, directed by David Freeman, entailed stage entrances through the audience and banda playing in the gallery.

The Challenges

Opera performed on an arena scale needs sound reinforcement just to beat audience noise such as coughing, creaking seats and sweet wrappers.

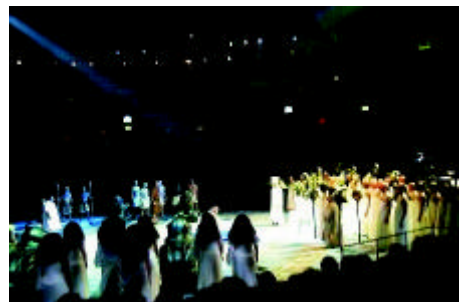
With the benefit of the experience of the previous two arena productions of Tosca and Madam Butterfly, the main challenge was to improve on what had gone before both in terms of quality of the imaging and as important, reducing the time required in the venue to setup the Image Definitions for the various stage zones.

The Approach

With a stage measuring 20 x 25 meters, a Source Oriented Reinforcement approach required the use of multiple simultaneous time alignments to the speaker system, with a localisation delay setup programmed for each of several stage zones

The stage was divided into several such zones, each around 5 meters diameter and a time alignment or Image Definition was setup on the TiMax system for each zone . As the actors moved around the stage, the Image Definition applied to the signal from that actors microphone is changed.

The sound system for vocal reinforcement consisted of front fill loudspeakers built into the stage floor and covered with grills while the main PA was split into down fills for upper stalls coverage and long throw speakers for upper boxes and upper circle coverage. These were distributed and flown on a circular truss approximately following the line of the edge of the stage, however sight lines restricted the flown PA to a minimum height of 15 meters above the deck.



The TiMax Solution



The on stage positions of soloists and chorus are recorded on a cue by cue basis on the TiMax computer, while the post fade signal from their radio microphones are fed to TiMax inputs.

As the opera progresses, the balance engineer at front of house calls pre programmed TiMax cues with the effect of applying a unique time alignment to the loudspeaker system for each microphone, so ensuring the timing precedence of the unamplified vocal from the singer over the amplified sound.

The result is that the audience tend not to hear the loudspeaker system.

The Tricks

Precedence effect also known as Haas effect can be exploited to help make amplification systems transparent.

The ear tends to integrate together multiple arrivals of sound providing the delayed arrival is not greater than the threshold of echo perception. For most sounds and listeners this threshold is between 20 - 30mS, which defines the maximum size of a stage zone or action area for Source Oriented Reinforcement at 6 - 8 meters diameter.

The blocking of stage positions for the cast was done during off site rehearsal, while delay setups were imported into TiMax from a calculation spreadsheet created using measured data of spatial relationships between stage zones, speaker positions and audience positions.

The basic calculation of Delay to loudspeaker (L) covering audience area (A) for stage zone (Z) is as follows where distances are in meters.

$$\text{Delay (mS)} = 2.94 \times (\text{Dist. ZA} - \text{Dist. LA})$$

The speed of sound through air is ~340M/S therefore to travel 1 meter it takes 2.94mS.

