

# TiMax Application Example - "Missa Solemnis pro Jubileo" at "Colosseum Rome"

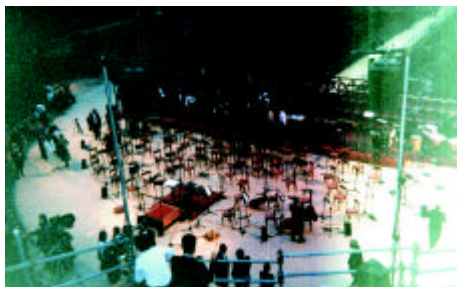
## The Premise



An orchestral and operatic performance dedicated to Mother Teresa of Calcutta, staged in the Colosseum Rome during July 2000, was notable as the first public performance in this stunning historical arena for 1,500 years.

The performance included large orchestral pieces, solo operatic and full choral sections with and without orchestral accompaniment, Gregorian plainsong and even Didgeridoo and Sitar solos.

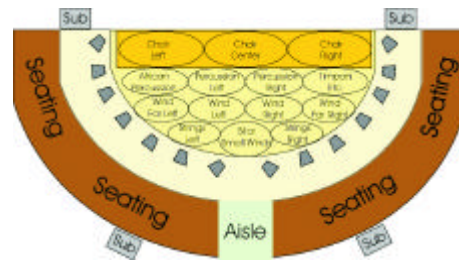
An audience of several hundred of Rome's glitterati attending the one and only performance of the piece were seated in a 180 degree arc 4 rows deep with the front row only 2-3 meters from the edge of the stage.



## The Challenges

As the audience were very close to some instrument groups and up to 30 meters away from others, the major concern was to deliver an even balance of instruments to all of the audience while making the sound reinforcement as transparent as possible.

In addition to the orchestral reinforcement, the choir and soloists needed considerable amplification to be heard over the top of the orchestra and background traffic noise, but again the sound designer was concerned that the reinforcement should be totally transparent with every measure known taken to ensure that the loudspeakers were as unobtrusive as possible.

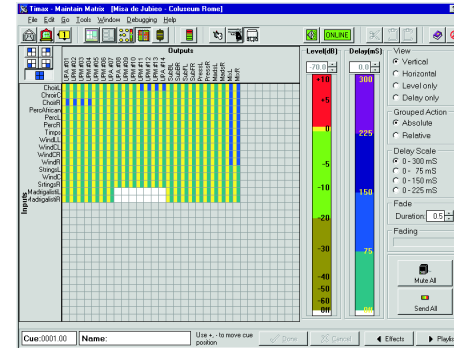


## The Approach

All of the instruments were close mic'd and submixed to groups on the console by orchestral or choral section as indicated on the diagram above.

Each group was then given its own unique time alignment to the loudspeaker system which consisted of a combination of Meyer self powered UPM and UPA boxes positioned on the ground as indicated on the sketch above.

## The TiMax Solution



The TiMax setup was programmed using the matrix screen. Delays for each instrument group to the loudspeaker system were calculated using measurements from the center of each stage zone to the closest seat on axis to the speaker being set up, less the distance from the speaker to that seat.

The resulting difference in distance is multiplied by 3 to convert from meters to milliseconds, then to give depth to the zone and to ensure that phasing is minimised, an overdelay factor of 15mS was added.

The configuration required each of the 14 stage zones to have 14 time delays, the outputs of which are summed together with the corresponding tap from the other 13 zones deriving the feed to each loudspeaker, or put another way, the system used 196 time delays.

All levels from every zone to every speaker were set to unity gain (0dB) to ensure that the reinforced mix as set by the balance engineer was as even as possible to every seat.

## The Tricks

Precedence effect also known as Haas effect can be exploited to help make amplification systems transparent. Providing that the acoustic level from the loudspeakers is no more than 6dB louder than the acoustic level from a group of instruments and provided the delays are set so the preceding wave front comes from the instrument with the amplified signal arriving not later than 20mS later, then the loudspeaker will not be identified as an acoustic source, but the audience will perceive an increase in level.

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, allowing for an overdelay margin for the most upstage position in the zone.

By ensuring that the criteria outlined above are met, each seat gets the same balance of levels from each section of the orchestra, while a match between the visual and acoustic perspective is maintained for all seats.

In order to give the FOH mix engineer a representative monitor feed, a further pair of speakers were set up at mix position. These were delayed relative to the stage zones in the same way as the main system.