

The Sound Field of a Live Classical Music Concert Vividly Reproduced in a Public Experiment

The Science and Technology Research Laboratories (STRL) and the Tokyo Philharmonic Orchestra held a public experiment to recreate the sound field of a live orchestra performance at a remote venue. The event took place on January 29, 2009 using two concert halls at Tokyo Opera City.

In this demo, the Tokyo Philharmonic performed in Tokyo Opera City's 1,632-seat Takemitsu Memorial Hall (Photo 1).¹ During the performance, the sound field of the concert was vividly reproduced in real time in Tokyo Opera City's Recital Hall, which has a seating capacity of 286. The listeners in the recital hall were treated to a virtual experience of the live concert.

Advanced Live Sound Field Reproduction System works as follows (Figure 1). First, sound engineers measure the acoustic characteristics of the main concert hall prior to the performance. During the concert, dozens of microphones are positioned to pick up specific target sounds, including the instrument groups in the orchestra and ambient noise such as applause. The collected sound data are digitally transmitted to the reproduction site, where the orchestral sounds are processed in accordance with the previously measured acoustic characteristics, duplicating the reverberation of the main concert hall. At the reproduction site, speakers positioned in front of the audience reproduce the sounds of the orchestra, while others located at the sides and behind the audience reproduce the reverberation and applause. The volume level of each speaker is fine-tuned to match the sound field in the main concert hall. The demo involved the use of 33 microphones to capture the orchestral sounds, and 10 more to capture the applause and ambient sounds. At the reproduction site (Recital Hall), 21 speakers were placed in four rows in front of the audience, and 16 surround speakers were positioned elsewhere to reproduce the acoustic field (Photo 2).

Because this reproduction system can be used in a wide listening area, it allows many people to enjoy the faithful reproduction of a live concert at a remote site. The area close to the front speakers offers crisp and clear sounds, while members of the audience sitting toward the back can enjoy richer acoustics. Approximately 150 people participated in the public demo (Photo 2). "It felt as if I

were at the real concert venue," one listener enthused, while another commented, "I could enjoy the music without distraction."

¹ The 43rd regular concert of the Tokyo Philharmonic Orchestra (the program included Beethoven's Symphony No. 4 in B Flat Major, op. 60, and excerpts from Wagner's Ring of the Nibelung. Conductor: Peter Schneider.) (Kimio Hamasaki, Senior Research Engineer, Advanced Television Systems)



Photo 1: Concert Hall (Tokyo Opera City Takemitsu Memorial Hall)



Photo 2: Reproduction Site (Tokyo Opera City Recital Hall)

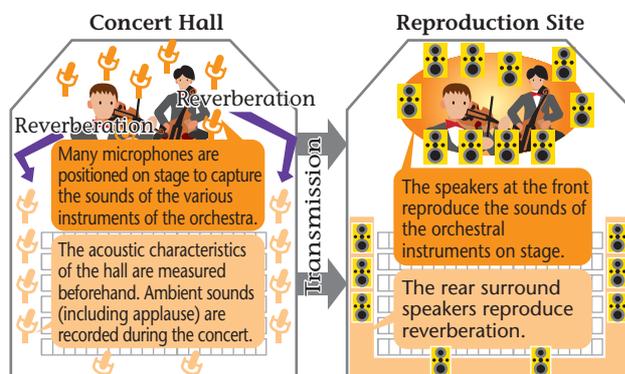


Figure 1: Advanced Live Sound Field Reproduction System

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