L-ACOUSTICS SOUND SOLUTIONS:

SPORTS FACILITIES
INTRODUCTION

When the founder of L-ACOUSTICS®, Dr. Christian Heil, invented the V-DOSC system – the very first line source system featuring the exclusive WST technology in 1992 – it revolutionized the professional audio industry.

Since 1984, a large body of theoretical research and experience is behind every system that L-ACOUSTICS develops. Today, L-ACOUSTICS sound systems are considered the #1 choice for energizing international events ranging from the Hollywood Bowl to the Olympics ceremonies, the FIFA World Cup and countless facilities worldwide.

As sports and entertainment business continue to converge, sports facilities are increasingly required to provide a level of excellence in sound reproduction equal to a live concert-like experience, by fans and advertisers alike. This sports facilities brochure presents a select number of sports facility challenges and solutions tackled by owners, consultants, engineers and contractors with L-ACOUSTICS systems. From the early stages of design through to system commissioning, every sound system sports facility project presents its own unique set of objectives, challenges and constraints. With L-ACOUSTICS, we always find the solution.

We look forward to delivering The Best Sound to your fans in fields, courts, and ice rinks across the planet!

Cédric MONTREZOR
Director of Application, Install
L-ACOUSTICS was selected to electrify the London 2012 Olympic Stadium with a capacity of 80,000 for the Opening and Closing Ceremonies of the Olympics and Paralympics as well as for every single athletic event held within the Olympic Stadium for over a 120 day period in total.

“I THINK ALMOST EVERYONE COMMENTED ON THE TREMENDOUS ATMOSPHERE IN THE STADIUM AND THE L-ACOUSTICS AUDIO SYSTEM CERTAINLY MADE A SIGNIFICANT CONTRIBUTION TO THAT.”

Roland Hemming, London Organising Committee of the Olympic and Paralympic Games (LOCOG) Venue Technical Manager - Audio, UK
A PARTNER FOR SPORTS FACILITIES

DELIVERING A CONCERT SOUND EXPERIENCE FOR EVERY FAN

With a good sound system, everyone enjoys the show. L-ACOUSTICS’ number one goal is to create an unprecedented sonic experience for spectators, with easily reconfigurable and widely accepted sound systems.

Combining breathtakingly high-impact sound reinforcement with stunningly pristine intelligibility, our systems deliver a truly immersive experience for sports fans as well as enhanced results for advertising partners.

Our high-quality systems allow sports facilities to become truly multi-purpose venues, with the potential to create or enhance additional revenue streams.

How is this achievement possible? L-ACOUSTICS has been designing reference line array systems for more than 20 years. Our exclusive technologies, providing enhanced directivity control, allow L-ACOUSTICS to:

• provide consistent Sound Pressure Level, and sonic experience, to every audience member

• enhance the intelligibility of the system, ideal for spoken word messages

• provide enhanced zoning capabilities, optimizing acoustics and offering energy savings and flexibility in your system set-up

L-ACOUSTICS speakers focus all of their sonic energy on a particular segment of the audience. This allows an exceptionally coherent sonic signature in very long throw applications, beyond the limits of other systems.
Developed for sound designers, SOUNDVISION is dedicated to the acoustical and mechanical simulation of L-ACOUSTICS systems. It is the first 3D sound design program capable of real time calculation of SPL and visualization of system coverage for complex sound system and venue configurations. System time alignment of multiple loudspeakers or arrays can be visualized with delay mode and the mechanical data provides detailed set-up information for installers and riggers.

“When looking at a large venue sound system, predictability is essential.”
Charlie Lawson, formerly Director of Audio, AVI-SPL, USA
POWERFUL ACOUSTIC SIMULATION TOOLS

L-ACOUSTICS has developed a powerful design tool dedicated to the needs of consultants and system contractors. SOUNDVISION® projects sound simulations according to the physics of light, creating a visual representation of your “sound vision”. L-ACOUSTICS SOUNDVISION is the first real time 3D sound design program capable of 'showing' sound sources as if they were light projections.

SOUNDVISION allows sound designers to visually design and optimize the performance of L-ACOUSTICS sound systems in individual sports facilities. This intuitive 'what you see is what you get' visual approach provides the greatest speed and accuracy in:

- predicting and adjusting the sound design according to the exact geometry of the facility
- providing equipment options to balance between Sound Pressure Level and budget

NO CUSTOM MECHANICAL DESIGN

All L-ACOUSTICS sound systems are engineered to be adapted to any environment and come with a rigging system that does not require any additional mechanical development. The mechanical behavior of the sound system is integrated into SOUNDVISION. This enables a fast, predictable and secure mechanical simulation that consultants and system integrators can rely on.

With L-ACOUSTICS, the design phase of a sound system for sports facilities brings an unprecedented level of predictability alongside the maximum efficiency.

* L-ACOUSTICS can provide electro-acoustic modules to offer compatibility with third party software such as EASE, CATT, LARA and ODEON.
“I was told that an L-ACOUSTICS solution would sound at least ten times better than what we had been using. Once the team had performed the installation, I had to admit that they were right. The sound is absolutely spectacular.”

Derrick Howard, Executive Director Freeman Coliseum

**LOCATION**
Texas, USA

**CAPACITY**
| 9,800  | (Basketball) |
| 11,700 | (Boxing)    |

**EQUIPMENT LIST**
- 8 x 5 ARCS FOCUS
- 8 x 2 SB18i
- 6 x LA8
- 2 x LA4
**CHALLENGE**

The sound system of San Antonio’s Freeman Coliseum is frequently called upon to provide speech reinforcement for graduation ceremonies, corporate functions and other similar events. As part of a multi-year initiative to update the venue, Bexar County and the facility’s management team decided to replace the old system to improve intelligibility.

**SOLUTION**

The decision was made to replace the sound system entirely. The improved sound could be heard and measured with an onsite evaluation. It was also the most cost-effective solution. An L-ACOUSTICS WST constant curvature line source was chosen for its high control of directivity preventing the spill of acoustic energy onto reflective surfaces.

**RESULTS**

After system commissioning, the intelligibility of the hall measured (according to the Speech Transmission Index value) reached between 0.70 to 0.82 per cluster, with an overall value of around 0.60, greatly improving the overall intelligibility of the system. These measurements were identical to those predicted by the acoustical simulation software.
“The L-ACOUSTICS system of distributed coaxial enclosures covers the stadium with breathtaking sound and even SPL.”

Guido Kacher, www.soniek.com, Bamberg

**LOCATION**

Bochum, Germany

**CAPACITY**

29,448

**EQUIPMENT LIST**

- 40 x MTD112b
- 22 x MTD115b
CHALLENGE

Prior to its renovation for the 2006 Soccer World Cup, rewirpowerSTADION was equipped with a 100V traditional sound system which delivered an uneven audience coverage and reduced bandwidth. As a result, the impact of music and advertising announcements on spectators were limited, and many spectators were “left out” of the show in zones where sound coverage was poor.

SOLUTION

The sound system (designed by the consultant) was based on a distributed L-ACOUSTICS coaxial system. This solution was technically validated by the client during a shootout session. A total of 40 MTD112b and 22 MTD115b were deployed to ensure the complete coverage of the audience in both the upper and lower tiers, respectively.

RESULTS

The new system measurements showed that a smooth SPL coverage within +/- 3dB was achieved throughout the audience and a bandwidth of 80 Hz to 16 KHz, at an exceptional price/performance ratio.
“The L-ACOUSTICS system delivers outstanding performance in terms of intelligibility, SPL and coverage.”
Yoshiteru Mimura, ARCHITO Co, Japan
CHALLENGE
A new PA system was required to reproduce music programs at the Nagai Stadium with an extended frequency range and a high SPL. The consultant had to find a balance between preserving the musicality of the system and maintaining the intelligibility necessary for announcements. Echoes created by the selected multi-cluster approach had to be minimized.

SOLUTION
The distributed design was deployed with ARCS constant curvature enclosures arranged in horizontal arrays (due to the fact that widely distributed vertical arrays tend to generate echoes). This WST system features a razor sharp directivity in the horizontal plane, thus creating audience sectors acoustically distinct from each other.

RESULTS
At a throw distance of 50m, the ARCS system distributed in arrays of 3-4 enclosures yields a consistent, cost effective coverage with early and late interferences reduced to minimum. The system combines intelligibility, musicality and clarity.
“DENIS HAINAUT, THE DIRECTOR OF ICE SPORTS FOR THE VANCOUVER WINTER OLYMPICS ORGANIZING COMMITTEE LISTENED FOR A WHILE, LOOKED AT ME AND SAID, ‘I’VE NEVER HEARD ANYTHING SOUND SO GOOD IN AN ARENA.’”

John Riley, Chief Audio Technician, Canucks Sports and Entertainment, Canada

Installation of the dV-DOSC system at Tampa Bay Times Forum, home of the Tampa Bay Lightning. The integration phase of an L-ACOUSTICS sound system can be completed in three days (rigging, cabling, amp racks and flying arrays) to meet busy sports facility calendars, with dramatic results.
A NETWORK OF CERTIFIED SYSTEM INTEGRATORS

L-ACOUSTICS carefully selects certified system integrators. Our System Integrator Charter outlines three key commitments:

• tailored services from specification to post-integration stage

• adoption of recommended technical standards to ensure the consistency and predictability of performance and operational safety of the sound system

• in-house trained personnel on multiple aspects of integration of L-ACOUSTICS

L-ACOUSTICS certifies its system integrators with official training seminars. Technical and engineering personnel are trained on theory, sound design, system set-up and rigging procedures for all systems.

STANDING BEHIND EACH PROJECT

L-ACOUSTICS stands behind the integrators and the consultants for every single installation project, from project analysis, system specification, engineering, integration, commissioning and maintenance services ensuring that the system will work at its best. L-ACOUSTICS clients’ benefit from dedicated L-ACOUSTICS manufacturer support.

Sports facilities can expect the highest quality of service, whether the project is design built by an integrator or specified by a consultant and awarded through a bidding process.

STREAMLINED INTEGRATION

With 30 years of designing touring systems, L-ACOUSTICS manufactures turnkey sound systems with an integrated rigging approach. No custom rigging is required to install an L-ACOUSTICS sound system, which dramatically reduces design and installation time. L-ACOUSTICS amplified controllers provide an EQ station, control and monitoring, DSP processing, and limiters all in one package, providing a full plug and play system for straightforward integration.
MEETING SHORT DEADLINES
ROGERS ARENA

“The scheduling for the sound upgrade was complicated by a ten day Janet Jackson tour event. We had a very small window to install the system, and it went like clockwork.”

John Riley, Chief Audio Technician, Canucks Sports and Entertainment, Canada

LOCATION
Vancouver, Canada

CAPACITY
18,890

EQUIPMENT LIST
6 x 13 dV-DOSC
6 x 2 dV-SUB
2 x 8 SB28
23 x LA8
CHALLENGE

The installation at Rogers Arena needed to be set up within an extremely tight deadline, just prior to the start of Vancouver’s NHL season home opener. It also had to be agile enough to cover a planned architectural expansion to host the forthcoming 2010 Winter Olympics Ice Hockey games.

SOLUTION

SOUNDVISION allowed the system rigging to be implemented and fully documented ahead of time. At the same time the system was zoned to provide coverage for the new press box seating and Olympic expansion zones.

RESULTS

System tuning and alignment using the advanced preset library was incredibly fast using LA8 controlled amplifiers and LA NETWORK MANAGER software. The System (rigging, cabling, amp racks) was installed over a three day period. System commissioning on day four was completed in time for the NHL Season opener, and the results were dramatic. The new system provided a high level of impact suitable for sports as well as multi-use events.
“The audience and field are 100% covered and speech intelligibility is excellent. At all measuring points, the PEAK SPL was 111 dB, within 1 dB. I believe we have designed the best arena sound system in Croatia.”

*Slaven Tahirbegovic, Dicroic, Croatia*
CHALLENGE

Opened in time for the 2009 Handball World Championships, the Spaladium Arena had to meet a tight installation budget. The sound system was needed to be located in a single location in order to optimize the building infrastructure in terms of signal distribution, mechanical rigging and electrical power. This design called for a compact, lightweight central, long-throw scoreboard sound system with high SPL and intelligibility.

SOLUTION

The sound system is based on four cardinal arrays (E-W-N-S) of 9 dV-DOSC and 2 dV-SUBS (delivering LF frequency extension) flown around the scoreboard. An additional array of 9 dV-DOSC enclosures is rigged underneath the LED cube, covering the playing field. The amplified controllers are located in the grill, just above the PA. The weight does not exceed 400 kg per cluster.

RESULTS

The long throw capability of the L-ACOUSTICS WST variable curvature system allows the sound system to deliver a peak SPL of 111 dB on average across the entire audience for a bandwidth of 50 to 20 KHz. This is perfectly executed, with the audience areas and areas of play covered 100%, and excellent speech intelligibility in both areas.
“I pointed out the difference in the pattern control between L-ACOUSTICS and other manufacturers. Keeping the audio out of the broadcast and ice rink mics on the glass was essential to achieve gain before feedback.”

Charlie Lawson, formerly Director of Audio, AVI-SPL, USA

LOCATION
Florida, USA

CAPACITY
20,000

EQUIPMENT LIST
66 x dV-DOSC
12 x dV-SUB
8 x SB218
4 x ARCS
36 x LA48a
CHALLENGE

To engage spectators more closely in the action of the games on the ice rink at Tampa Bay Times Forum, reproducing the sound of the stick hitting the puck. It had to overcome the difficulty of the relationship between the placement of microphones on the glass which needs to pick up the sounds of the game but not the PA system.

SOLUTION

dV-DOSC and ARCS deployment ensured accurate coverage from the glass up to the top tier seating, and razor sharp vertical control to fulfill the design objective. ARCS were used under the scoreboard to supply high impact sound to the players on the ice surface. DV-SUB was added to the 6 main arrays with 2 x 4 SB218 additional subwoofers for enhanced low frequency extension and impact.

RESULTS

The system was implemented following the SOUNDVISION model. It produced extremely even coverage and the performance upgrade overall was dramatic. No delays were required, and the system was completely turnkey.
“The marriott center hosts something different every day, so we needed a very versatile system that could handle all those different types of events.”

Brad Streeter, Multimedia Engineer & Installation Project Manager, BYU, USA

LOCATION
Utah, USA

CAPACITY
20,900

EQUIPMENT LIST
32 x KARA
32 x KARAi
90 x KIVA
18 x KILO
8 x SB18
8 x SB18i
16 x LA8
16 x LA4
CHALLENGE

The BYU Marriott Center is a multi-use facility hosting NCAA Division I Basketball, convocations and devotional services and fine arts department productions. The sound system had to be fully configurable both mechanically and in terms of DSP control over a network connection.

SOLUTION

The system design provided 32 KARA elements for the flexible arrays, and 32 KARAi elements for the fixed arrays. Up to 32 elements can be arrayed for proscenium stage setup in 180 degree coverage, or split into smaller arrays as needed.

RESULTS

The system is extremely accurate. Using the KARA and KARAi offers a complete flexible multi-use system which is completely configurable. The entire top tier can be zoned on/off using the KIVA system and additional KIVA arrays in waterfall configuration offering complete, effective floor coverage.
L-ACOUSTICS systems are entirely engineered and manufactured in France. The company has a presence in 60 countries, employs 200 people worldwide with 25 languages spoken by employees. Five principles are at the heart of L-ACOUSTICS culture: innovation, consistent and predictable performance, a turnkey system approach, support and education of users and the longevity and durability of systems.

“I HAVE TO THINK VERY HARD TO REMEMBER THE OCCASIONS WHERE I HAVE EXPERIENCED COMPONENT FAILURE IN AN L-ACOUSTICS SYSTEM. WITH OVER 450 LOUDSPEAKER PRODUCTS DIRECTLY EXPOSED TO THE ELEMENTS FOR OVER FOUR MONTHS, THE SYSTEM RELIABILITY WAS KEY FOR LONDON 2012.”

Scott Willsallen, Auditoria Pty Ltd, London 2012, Ceremonies Audio Systems Designer, Australia
REVENUE GENERATION

A high performance and flexible sound system contributes to revenue generation. Offering a high impact and immersive experience attracts more spectators, while providing high quality speech intelligibility meets advertiser demands. In addition, a rider-friendly sound system helps facilities to attract high profile events. Finally, the ability of L-ACOUSTICS systems to be reconfigured enables multi-use facilities to diversify their income streams.

LONG TERM INVESTMENT

L-ACOUSTICS systems boast an exceptional durability. For over 30 years L-ACOUSTICS systems have been used as touring and festival systems on a daily basis in challenging outdoor environments. All of our installation products meet the IP45 rating. Our earliest sport facilities clients have been enjoying their MTD 115 sound system for more than fifteen years with MTD 115 continuing to deliver outstanding performance today. All our systems come with a warranty of five years.
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For more reference information please visit:
www.l-acoustics.com/installations
www.l-acoustics.com/picture-gallery
Sound Field Radiated By Arrayed Multiple Sound Sources
AES Convention Paper #3269 - 92nd AES Convention - 1992

How to know whether it is possible or not to predict the behaviour of an array when the behaviour of each element is known? Our purpose is to describe the sound field produced by arrays in such a way that criteria for “arraybility” can be defined.

Wavefront Sculpture Technology
AES Convention Paper #5488 - 111th AES Convention - 2001

We introduce Fresnel’s ideas in optics to the field of acoustics. Fresnel analysis provides an effective, intuitive approach to the understanding of complex interference phenomena and thus opens the road to establishing the criteria for the effective coupling of sound sources and for the coverage of a given audience geometry in sound reinforcement applications. The derived criteria form the basis of what is termed Wavefront Sculpture Technology.

Wavefront Sculpture Technology
AES Journal - Vol. 51, n°10 - 2003

The Fresnel approach in optics is introduced to the field of acoustics. Fresnel analysis provides an effective, intuitive way of understanding complex interference phenomena and allows for the definition of criteria required to couple discrete sound sources effectively and to achieve coverage of a given audience geometry in sound-reinforcement applications. The derived criteria from the basis of what is termed Wavefront Sculpture Technology.
The Distributed Edge Dipole (DED) Model for Cabinet Diffraction Effects
AES Journal - Vol. 52, nº10 - 2004
A simple model is proposed to account for the effects of cabinet edge diffraction on the radiated sound field for direct-radiating loudspeaker components when mounted in an enclosure. The proposed approach is termed the Distributed Edge Dipole (DED) model since it is developed based on the Kirchoff Approximation (KA) using distributed dipoles with their axes perpendicular to the baffle edge as the elementary diffractive sources. The DED model is first tested against measurements for a thin circular baffle and is then applied to a real world loudspeaker that has a thick, rectangular baffle. The forward sound pressure level and the entire angular domain are investigated and predictions of the DED model show good agreement with experimental measurements.

Performance audio + intelligibility + evac = ?? a loudspeaker manufacturer’s take
Institute of Acoustics - Vol. 33. Pt. 6. - 2011
Using several case studies, L-ACOUSTICS will present working solutions to balancing high performance audio, STI requirements, and evacuation system integration through the use of line source array technology, loudspeaker monitoring, smart controller amplifiers, and network control and switching. This will serve as a launch pad for discussion of technology changes in place and in the works by performance audio manufacturers.
ENVIRONMENTAL CREDENTIALS

GREEN SOUND SYSTEMS
- L-ACOUSTICS line arrays have replaced the wall of sound from the ‘80s
- acoustic energy focused on the audience, less noise pollution
- minimized acoustical interferences and electrical energy waste

MODERN ELECTRONICS
- highly efficient power supplies and sophisticated system control
- high-powered Class D amplification of LA8 electronic
- elevated energy efficiency close to 85% (versus 50% in the ‘80s)

MANUFACTURING, STORAGE AND SUBCONTRACTING
Assembly plants, storage, and R&D departments are all local. 100% of our suppliers and subcontractors are located in France or Europe.
- SIMEA joinery: Alsace, France
- electronic assembly: Germany
- assembly of the loudspeakers: Marcoussis, France
- origin of speaker parts: European region
- wood: from renewable forests in Finland and Lithuania

RECYCLING
- wooden pallet recycling
- paper and cardboard recycling: systematically sorted at every workstation and collected by specialized companies
- recycling of computer equipment and consumables

LOUDSPEAKER COMPONENTS
- all metallic parts used in the loudspeakers are recyclable
- wood cabinets: no toxic product rejects
- wood: L-ACOUSTICS participates in a reforestation program for the Baltic area