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'Chaillot National Theater' Adopts 3D Sound

Amadeus designs and installs a 'holophonic' sound system for Chaillot National Theater, with Solid State Logic, Lab.gruppen & Sonic Emotion

Paris, France — November 28, 2016 — French speaker manufacturer **Amadeus**, has announced the install of a '3D Sound' system within **Paris' Chaillot National Theater**. Along with Solid State Logic (SSL), Lab.gruppen and Sonic Emotion, the four companies joined forces to design a one-of-a-kind electro-acoustic sound system for the theater, which is one of the most historical and prestigious in France. Amadeus has become one of the premiere manufacturers of high-end sound reinforcement systems for live and installed sound throughout Europe and Asia, while also designing and installing studio monitors. The Chaillot National Theater's new 3D sound system has already been used in the production of original contemporary dance productions featuring choreographers, dancers and actors including, Olivia Ruiz, Jean-Claude Gallotta, Carolyn Carlson, Aesoon Ahn, Antony Hamilton, José Montalvo, Thomas Lebrun, and Rocio Molina.

法国巴黎-2016年11月28日—法国扬声器制造商Amadeus宣布“3 d音响”系统已经安装于巴黎Chaillot国家剧院。与SSL, Lab.gruppen和Sonic Emotion一起,这四家公司联手为这家在法国最富有最悠久历史并最具盛名的剧院设计了一个独一无二的电声扩声系统。Amadeus已成为欧洲和亚洲高端的现场和固定安装音响扩声系统的顶级制造商,同时也开展设计和安装监听工作室。Chaillot国家剧场新的3D立体音响系统已经用于创作原始当代舞蹈作品的编舞,舞者和演员,包括奥利维娅鲁伊兹,特里Gallotta,卡洛琳·卡尔森Aesoon安,安东尼·汉密尔顿,何塞·蒙塔沃托马斯Lebrun,Rocio莫利纳

As the sound reinforcement system used in the Jean Vilar hall (1270 seats) was due to be replaced, Amadeus imagined a solution that would go beyond the limits of traditional technologies such as stereo, 5.1 multichannel format, or any conventional speaker system. The implemented solution uses the Wave Field Synthesis (WFS) technology. Like visual holograms, this 'holophonic' process captures or creates a sound stage by preserving spatial information: the distance and direction of the sound sources used.

由于音响扩声系统用于更新 Jean Vilar 厅(1270座), Amadeus设想一个解决方案,将超越传统技术的局限性如:立体声、5.1多声道格式,或任何传统的扬声器系统,实现的解决方案就是使用WFS(波场合成)技术,正如视觉全息一样,这种“holophonic”(全息?)的过程就是获取或创建一个由声源的距离、角度组成的空间信息。

"This technique allows to replicate the sound field's physical properties. Wherever they are in the theater, the listener keeps a coherent perception of the sources' localization," explains **Marc Piera**, Chaillot National Theater's Sound Department Manager.

“这种技术可以复制声场的物理特性,无论他们是在剧院里,听众都能拥有相同的感知声源位置的体验,”国家剧院的音响部门经理Marc·Piera Chaillot这样解释。

"I personally consider that the systems using a single-dimension speaker network, like line arrays, are inept for sound reinforcement in most theatre buildings," adds **Piera**. "These systems were primarily designed for open field concerts, where the audience area is very wide and very deep, and most of the time, on a flat or lightly sloped ground. They create a uniform sound pressure field, but most often they degrade the sound image for most of the audience. The Jean Vilas hall's intrinsic technical, acoustical, physical and mechanical properties led us to prefer an original sound reinforcement system, based on a 'holophonic' concept. Listening conditions are thus identical for all spectators, wherever they are in the hall."

“我个人认为使用一维的扬声器网络,例如线阵列,用于大多数剧院建筑的扩声系统,这都是不合适的,”Piera补充道。“这些系统(线阵列)主要是用于户外音乐会,同时听众区很宽很深,而且大多时候都是在平坦或稍微倾斜的地面。他们创建一个统一的声场,但他们通常大多数时候都降低了观众的声象。吉恩·维拉斯大厅的内在技

术、声学、物理和机械性能引领我们热爱这个原始的基于“holophonic”概念的扩声系统。所有观众在大厅里什么位置，他们的聆听条件都是完全相同的。”

The Jean Vilar hall's bleachers are segmented in four sub-spaces, each of different dimensions, seat numbers and slopes. The bleacher's curvature is almost exponential, with 16°, 23°, 25° and 35°-slopes. The control room sits 12 meters above the ground. The spectator area has a surface of 1122 sq. m (33m-deep, 34m-width).

Jean Vilar hall的看台分割成4个子空间，每个都有不同的尺寸、座位数量和坡度。看台的曲率基本呈指数型，大致是16度，23度，25度，35度的斜率。控制室位于地面上方12米，观众区域面积达到1122平方米（33米深，34米宽）

Piera continues, "A traditional line source system, with constant or variable curvature, placed in a classical configuration, would inevitably have affected the sources' localization, according to Haas' effect. In the 1940s, this German scientist established that a source's localization is given by the direction of the first sound reaching the ear (direct sound). If the difference between the spectator's position, the primary source and the secondary source grows, the this effect becomes stronger."

Piera 继续说，“传统的线声源系统，被置于一个恒定或变量曲率的典型的结构里，根据“哈斯效应”，势必会影响声源的定位。在1940年代，德国科学家已经确定，声源的定位是由第一次到达耳朵的声音（直达声）的方向来决定的，如果听众之间的位置差异、一次声源和二次声源的叠加，这种效应会得以增强。

Chaillot National Theater Technical Manager, **Denis Desanglois**, says "The Chaillot National Theater is one of the five national French theatres. For a long time, it was an iconic 'theatre for the people' symbol, linked with famous names like Jean Vilar then Antoine Vitez. This place offers a large stage for dancers, with a viewing angle and a visibility on a par with their vitality. Our continuing mission is to develop and to support creation and diffusion of the works, and to foster their encounter with the widest audience possible."

Chaillot 国家剧院技术经理 **Denis Desanglois** 表示，“Chaillot 国家剧院是法国五个国家剧院之一。很长一段时间，与著名的 Jean Vilar，以及 Antoine Vitez 一起，她都是一个标志性的“人民剧院”的象征。这个地方为舞者提供了一个拥有 with a viewing angle and a visibility on a par with their vitality 的大舞台。我们持续的任务就是发展和支持创作和扩散的工作，并培育他们最广泛的观众。”

"We intended to replace our sound reinforcement system, which had not been completely satisfying until now," explains **Desanglois**. "We wished to abandon the stereophonic paradigm, the line array-type. So we implemented a WFS-based system prototype and asked the companies we were working with for their feedback. Some technicians were totally initially disoriented, but eventually everyone was happy, technicians and artists alike. The sensations of listening are completely different, wherever you are in the hall, you experience the same sound, that's pretty amazing." 我们早就打算更新我们的扩声系统，直到现在才得以令人完全满意的实现，**Desanglois** 解释说，我们希望放弃立体声的模式，线阵列的形式，于是我们实现了一个基于WFS的系统原型，并要求与我们合作的公司提供他们的反馈信息。最开始一些技术人员完全迷失了方向，但是最后每个人都非常开心，包括技术人员和我们的艺术家们。完全不同的听感，无论你在大厅任何位置，你体验到的声音都是一致的，这都是令人非常的惊艳。

"We even integrated a 24-speaker ramp in the front end of the stage, to avoid the usual 'sound hole' first row of seats!" **Desanglois** concludes.

“我们甚至集成了一个24只音箱布置在舞台前面，以避免通常第一排座位的声音空洞的现象！”**Desanglois** 总结道。

Based on Huygens' Principle (1678), the idea of Wave Field Synthesis (WFS) was developed in the Netherlands in the 1980s by the Delft University of Technology. WFS concept makes it possible to synthesize "sound holograms" by simulating acoustic waves produced by virtual sound sources. To do this, the system uses a large number of loudspeakers, regularly spaced and used conjointly. They are each controlled with a delay and a gain to form a wave that emanates from the desired location of the virtual source. This process is repeated for each sound source in the sound scene. The major benefit of the WFS technique is to create a coherent sound field in an extensive area, therefore preserving the fidelity of the spatial image - the position of the sources - even for listeners located at the periphery of the zone or for listeners moving within the zone.

基于惠更斯原理(1678),波场的概念合成(WFS)是由荷兰的代尔夫特科技大学在 1980 年代开发。WFS 概念可以合成“声音全息”，通过模拟虚拟声源产生的声。要做到这一点,该系统需要使用大量的扬声器,规律的布置和结合地使用。他们单独控制每个虚拟声源位置的声波与延迟和增益，这个过程就是在声音场景中重现每一个声源。WFS 技术的主要好处是创建一个相干声场在一个广泛的区域,因此保留一个真实的的空间结像——声源位置——即使是听众的位置内或听者是在区域内移动的听众。

SPEAKER PLACEMENT:

A first line of passive coaxial loudspeakers has been integrated in the front edge of the stage (in a 12cm-deep, 18cm-high volume). These 24 loudspeakers, variants of Amadeus PMX 4 model, form a large-scale 'sound bar'; they are evenly distributed across 18m, with 75cm between each adjacent speaker. This first line seamlessly covers the first row of seats.

扬声器系统布置：舞台前端整体安装着第一行被动式的同轴扬声器（12厘米深,18厘米高），这24只扬声器，由莫扎特PMX4演变而来，来自于一个大比例的‘sound bar’，他们均匀的分布跨度18米，每个扬声器之间间隔75厘米，这组扬声器能够无缝地覆盖前排的观众区。

Piera adds, "Since the Renaissance, people placed close to the stage are, paradoxically, the less privileged spectators. Limelight, candlesticks or oil lamps, generated a dense fog, intruding between spectators and the stage. A few centuries later, this fog left, only to place a 'sound hole' there for the same spectators.

Prera补充道：“自文艺复兴以来，人们都被置于靠近舞台的地方，矛盾的是，随着特权阶级的减少，聚光灯，烛台或者油灯，在观众和舞台之间挤入一片烟雾。几个世纪以来，这片烟雾消失了，仅仅只是给同样的观众留下一个“声场空洞”。

Electro-acoustical sound reinforcement aimed for these first-row spectators is often too inefficient, if not missing. Staging allowing, a small 'front fill' speaker is tolerated at best. Here, Amadeus' sound ramp is seamlessly integrated to the location's scenography, and it's perfectly dimensioned for our purposes; it redefines the perception of sound and, at last, offers these spectators a real sound and sensory privilege."

电声扩声的目标对这些前排观众通常都太低效的，舞台最多可以允许布置一个小的“前场填充”扬声器，在哪儿，莫扎特的 Sound Ramp可以无缝地与场地的布景结合，而且他的尺寸也能完美地满足我们的目标，他能够重新定义声音的感觉，并且最起码能够提供给这些观众一个真实的声音和感知的权利。

The second line of loudspeakers is made of 11 Amadeus UDX 15 active coaxial speakers, with remote bi-amplification. These loudspeakers are evenly spaced across 23.5m (identical spacing between each of them), and they are placed at 9m height. This line covers the first two thirds of the bleachers. A third line is made of 11 Amadeus UDX 12 active coaxial speakers with remote bi-amplification. It is hung to the second technical bridge. These loudspeakers are evenly spaced across 23.5m (identical spacing between each of them), and they are placed at 9m height. This line covers the first two thirds of the bleachers. A fourth 'Surround' line is made of 6 Amadeus UDX 12 active coaxial speakers, with remote bi-amplification. These are hung to the second technical bridge. A unique bass reinforcement system is set up on lateral first level technical bridges, on left and right-hand sides. It is made of 6 Amadeus MAESTRO subwoofers, each hosting two long-excursion speakers, loaded by a folded hyperbolic horn. Rear acoustic wave rejection is optimized via a specific baffle.

第二行扬声器由11只莫扎特主动式带远程控制的UDX15同轴扬声器组成，这些扬声器均匀地分布在23.5米的（他们之间的距离完全相同）跨度里，高度9米。这条线可以覆盖第一个看台的三分之二的区域。第三行扬声器是由11只莫扎特主动式带远程控制的UDX12同轴扬声器组成，It is hung to the second technical bridge，这些扬声器也都均匀地分布在23.5米的（他们之间的距离完全相同）跨度里，高度9米，第一个看台的三分之二的区域。第四行环绕由6只莫扎特主动式带远程控制的UDX12同轴扬声器组成，These are hung to the second technical bridge. 一组独特的低音扩声系统被设置在first level technical bridges的左边和右手边。他们由6只莫扎特MAESTRO超低音组成，每只包括两只长冲程扬声器单元，加载一个折叠的双曲线号角，背向的声波通过一个特殊的障板反射充分利用。

This sound system is completed with an SSL Live L300 digital mixing console, used with two Network I/O SB 8.8 (8 analog I/O each) and two Network I/O SB i16 (16 analog inputs each) Dante stageboxes. The SuperAnalogue technology used in these SSL-developed interfaces ensures clarity and precision.

这个声音系统是由SSL.....组建而成

Philippe Guerinet, Director of International Sales for SSL and SSL France Manager, said, "We were impressed by the warm welcome received by our SSL Dante solutions in the live and broadcast sectors. With their Dante media networking technology, Audinate are clearly leaders now, with more than 350 manufacturers and more than 800 Dante-enabled products. Their approach is innovative, reliable and affordable in every aspect, the Chaillot National Theater install is an excellent illustration of this."

"Audio over IP allows us to put the stageboxes where needed, with minimal and redundant cabling, and to connect on the network all kinds of Dante-enabled gear: Amadeus sound reinforcement system, SSL L300 console, SSL Network I/O stageboxes, and every other ancillary equipment needed. This network approach notably allows us to solve classic problems, like signal distribution without adding any TDM routers; there's no loss, either noise induced in the audio signals, and latency is particularly low. Last but not least, the technical solutions chosen by the Chaillot National Theater ensure total flexibility and an astonishing audio quality, for a surprisingly affordable budget," states **Guerinet**.

Severine Krouch, Sound Stage Manager, concludes: "The design philosophy brought by these two famous brands, Amadeus and Solid State Logic, with their sonic signature and their prestigious pedigrees, allow us to work every day with studio monitoring-grade sound, extended to a very large scale, and to innovate with the sound at the very heart of the artistic creation."

List of the products installed in Chaillot National Theater:

Amadeus

Custom-made sound ramp, made with 24 PMX4-type loudspeakers, 4-ohm version (4" LF + 0,4" HF): 1 unit
2-way Active Loudspeaker Amadeus PMX 15 (15" LF + 2" HF) : 4 units
2-way Active Loudspeaker Amadeus UDX 15 (15" LF + 2" HF) : 11 units
2-way Active Loudspeaker Amadeus UDX 12 (12" LF + 2" HF) : 17 units
Push-pull subwoofer, with ultra-high efficiency, hyperbolic folded horn and custom-made baffle (2 x 12" LF): 6 units

Solid State Logic

Network I/O SB 8.8 Dante stagebox (8 Mic/Line analog I/O): 2 units
Network I/O SB i16 Dante stagebox (16 Mic/Line analog inputs) : 2 units
Console SSL Live L300: 1 unit

Sonic Emotion

WAVE II 3D sound processor (64/64 MADI I/O)

Lab.gruppen

C10:8X power amplifier (8 x 125 W/8 Ω, analog I/O): 3 units
IPD 2400 digital power amplifier , with DSP (2 x 600 W/8 Ω, analog & AES3 I/O): 32 units
C88:4 power amplifier (4 x 1250 W/8 Ω, 4 x 2100 W/4 Ω, 4 x 2200W/2 Ω, analog I/O): 2 units
Lab.gruppen NLB 60E NomadLink remote control: 1 unit

About Amadeus

Amadeus develops, manufactures and sells a wide range of high-end sound reinforcement loudspeakers, studio monitors and various signal processing interfaces that combine its own custom innovative technology with stylish design, for the professional audio industry. Created in 1992 from the collaboration between the French designer Bernard BYK and the scientist and musician Michel DELUC, the Amadeus brand has grown to become a leading supplier of high-end audio solutions and services for theaters, opera houses, museums, recording studios, research centers and touring concert sound rental operations. All development and product manufacturing is centralized in Amadeus headquarters in France, with field offices and authorized distributors located in Europe, Asia and UAE. For any complementary information, please contact Amadeus: info@amadeusaudio.fr, or visit: <http://amadeus-audio.com/en/>

About Solid State Logic

Solid State Logic is the world's leading manufacturer of analogue and digital audio consoles and provider of creative tools for music, broadcast, live and post production professionals. For more information about our award-winning products, please visit: <http://solidstatellogic.com>

About Sonic Emotion

Sonic Emotion is the specialist for 3D sound entertainment since 2002. Beginning with the sound technologies originally developed for academic use, Sonic Emotion applied its expertise in the field to offer a scaled down version of the technology to meet the demands of consumers and professionals. Sonic Emotion's Wave I 3D sound processor is installed in a growing number of venues for live sound reinforcement, theaters, clubs, parties and audio-visual immersive installations. For further information please visit: <http://www2.sonicemotion.com>