



# CASE STUDY

The Solaris  
Cultural and Leisure Centre

Tallinn, Estonia

## Meyer Sound: A Singular Solution

The Solaris Cultural and Leisure Centre is a flourishing new hub for the performing arts and entertainment in the heart of Estonia's capital city of Tallinn. Beginning with the earliest conceptual phases, developers of this multi-use complex were determined to promote artistic excellence while helping to reenergize the city as a modern entertainment destination for local residents and tourists alike. The Solaris Centre underscored this commitment by investing in the best possible audible experience, choosing Meyer Sound as a single supplier for all critical audio systems at the complex, including cinema sound, live sound reinforcement, and active acoustics.



## SUMMARY

Estonia has emerged as one of the bright lights of northern Europe in the post-Soviet era, reinvigorating the Baltic region with both artistic innovation and leading-edge technologies. This vibrant energy is strikingly evident in Estonia's bustling capital of Tallinn. Among the bold new developments now revitalizing the city's historic core is the Solaris Centre, a multifunctional complex with its name inspired by gleaming glass walls and roof sections that capture the sun's energy for light and heat. Opened in late 2009, Solaris Centre encompasses the 1,829-seat Nokia Concert Hall, the Cinamon commercial cinema multiplex, the Artis art film cinemas, plus conference facilities, restaurants, shops, an art gallery and a fitness centre.

From the outset, developers of Solaris Centre were determined to support film exhibition and live performance at a level that would be unsurpassed anywhere in the world. The driving force in this commitment was Priit Rebane of the Baltic Development Group (BDG). A major shareholder in the Solaris Centre, BDG is a diversified entertainment company with interests in nightclubs and cinemas, concert promotion, and event production throughout the Baltic region.

"Through our interests in major concert promotion with international artists, we had developed a close relationship with Meyer Sound through Eventech, their representative here in Estonia," states Rebane. "We knew that we could rely on Meyer Sound for both the excellence of the products and reliability of local support."





## Project Partners

### Owner

Solaris Keskus AS  
Tallinn, Estonia

### Managing Partners

Baltic Development Group  
Tallinn, Estonia

### Principal Architect

Raivo Puusepp Architects  
Tallinn, Estonia

### Cinema and Theatre Architecture

Mesbur + Smith  
Toronto, Ontario, Canada

### Acoustical Consultant

Linda Madalick  
Tallinn, Estonia

### Audio System Design and Tuning

Dave Dennison  
San Francisco, California, USA

Meyer Sound  
Berkeley, California, USA

### Audio System Installation

Eventech  
Tallinn, Estonia

**Sound Reinforcement System:** For the Solaris Centre's keystone venue, the Nokia Concert Hall, a flexible Meyer Sound reinforcement system based around MICA and M'elodie line array loudspeakers is designed to support a wide range of amplified concerts and events, from rock and jazz to Broadway-style musical theatre and film screenings.

**Acoustic System:** In regards to other event programs at the hall, Meyer Sound's Constellation acoustic system plays a vital role in providing the acoustical characteristics ideal for each production. The physical room acoustics as designed by acoustician Linda Madalick are an ideal balance for amplified music as well as spoken word for conferences and theatre. Building on this foundation, Constellation's subtle enhancements effectively expand the scope of the hall's programming and earning potential, by accommodating orchestral and choral music in an optimum acoustical environment, while meeting the acoustical requirements for theatrical, conference and musical concerts.

**Cinema System:** The Solaris cinema centre comprises seven Cinamon commercial cinemas and two Artis art cinemas operated by the government-owned Estonian Film Foundation. Meyer Sound Cinema Experience is installed in all nine movie exhibition halls to deliver the remarkable sonic power and fidelity to keep patrons returning for an engaging and immersive movie experience.

*“We feel that Meyer Sound Cinema Experience is the best cinema sound system available today. It has exceptional headroom and clarity, very low distortion, and convincing bass. With the advent of digital cinema and uncompressed sound tracks, many cinemas will have to upgrade to meet those demands, but we are future-proof with Cinema Experience.”*

**Priit Rebane**

Baltic Development Group  
Managing Partner of Solaris Centre



Screen 1 of Cinamon Complex

## **CINEMA EXPERIENCE AT SOLARIS CENTRE**

### **The Cinamon Complex**

The seven-screen multiplex cinema in the Solaris Centre is operated by Cinamon, one of the largest commercial film exhibition companies in the Baltic region. The film selection at Cinamon appeals to all ages and backgrounds, and includes the latest Hollywood blockbusters as well as popular new works by filmmakers from throughout the Baltic region and elsewhere in Europe.

The Cinamon complex offers seven screening rooms, varying in capacity from 80 to 510 seats. Each room utilizes self-powered Acheron loudspeakers from the Meyer Sound Cinema Experience exclusively, with the component selection based on audience capacity, room volume and overall acoustical characteristics.

All seven screening rooms are designed to provide a premium quality listening experience, with consistent response from the largest to the smallest rooms. The systems were configured using the acoustic predictions in MAPP Online Cinema to provide the ultimate in cinema sound experience, whether from 35 mm film or new digital cinema formats.

Each room, regardless of size, is equipped with the same complement of behind-screen LCR mid-high loudspeaker systems: Acheron 80 systems at left and right, and an Acheron 100 in the center. The THX-certified Acheron loudspeakers have ample power to carry clear high-frequency sounds (above 580 Hz) to the far row seats of the largest cinema. Of equal importance to power is the extraordinary linearity of the self-powered Acheron design: the frequency response curve and phase linearity remain constant, regardless of the



One of two Cinema Artis movie theatres

## Challenges

- Wide variance in room sizes
- Introduction of digital cinema soundtracks

## Requirements

- Maintain room-to-room isolation
- Suited to both commercial cinema and art films
- Linear response at all playback levels
- Provide a premium movie experience

## Benefits

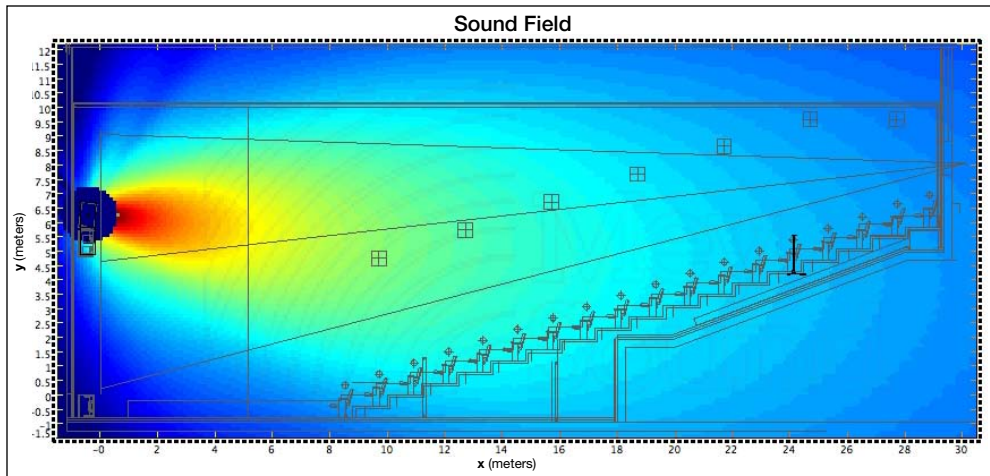
- Enhanced audience experience
- Compatible with digital cinema soundtracks
- Consistent sound across all room sizes

output level. This is a critical factor when cinema operators wish to maintain consistent audio quality in larger and smaller rooms. The Acheron loudspeakers will exhibit the same smooth, transparent audio qualities regardless of playback level.

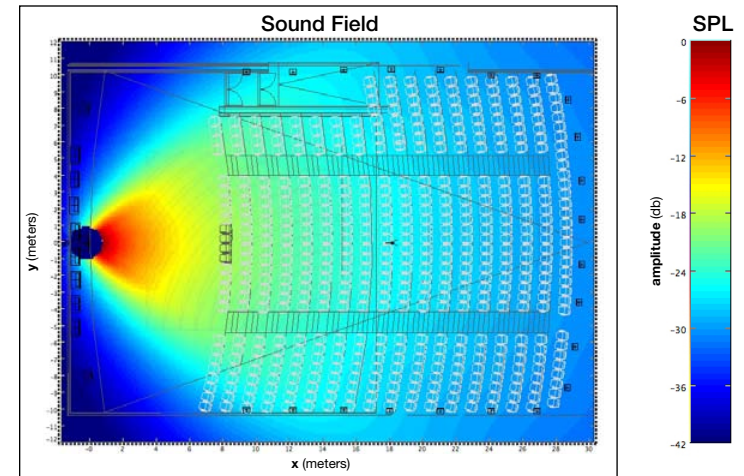
The lower frequencies demand the most power, and in the lower five octaves (as well as in the subsonic regions), additional low frequency support is provided in the larger rooms. For the low frequency region between 37 Hz and 370 Hz, the Acheron LF is mounted below the Acheron 80 or Acheron 100, and seamlessly blends with the response of its full range unit.

Screen	Capacity	Acheron 100	Acheron 80	Acheron LF	X-800C	HMS-10	Galileo
1	510	1	2	3	6	22	2
2	400	1	2	3	6	16	2
3	180	1	2	3	4	14	2
4	182	1	2		4	14	2
5,6,7	80	1	2		2	10	1





Acheron at 4kHz; Section plan in MAPP Cinema prediction



Acheron at 4kHz; Center plan in MAPP Cinema prediction

*The Solaris Centre has been selected as the host site for the 2010 European Film Academy Awards, the premier event of the European film industry. Scheduled for December, the awards gala will be broadcast from the Estonian capital direct to viewers in more than 50 countries.*

Modern commercial cinema soundtracks demand powerful sub-bass response, with low distortion and ample headroom for the extreme bass transients common in popular action-adventure films. Meyer Sound has unparalleled experience in this technology, as one of the company's first assignments was to design and build custom subwoofers for Bay Area premiere showings of Francis Ford Coppola's *Apocalypse Now*. This lineage is evident in the X-800C, a high-powered cinema subwoofer equipped with dual 18-inch drivers and on-board amplification with 2480 watts of peak power output.

All screening rooms utilize the self-powered HMS-10 two-way loudspeakers for surround channel reproduction. Multiple HMS-10 units receive DC power from a single rack-mount power supply and audio distribution unit, with both power and audio carried over a single, low-voltage multi-conductor cable. This approach minimizes installation costs, and makes each loudspeaker individually addressable and therefore ready to accommodate both current and future multichannel formats beyond 5.1. Signal processing throughout the complex is accomplished by Galileo loudspeaker management systems.

Prior to opening, all audio systems at Cinamon were precision calibrated and tuned by Meyer Sound engineers to meet the objective specifications for cinema sound reproduction, and to ensure the most pleasurable and exciting experience for discerning cinema patrons.

### Cinema Experience at Artis

Situated on the third level of the Solaris Centre, Cinema Artis offers a distinctively different flavor of film exhibition. Rather than a broad general audience, Artis caters to connoisseurs of art film genres. The two cinemas are operated by Tallinnfilm, a division of the government-owned Estonian Film Foundation (EFSA). As described in Tallinnfilm's promotional materials, Cinema Artis offers a "shockingly bold film selection, with a colorful mix of the best titles in Estonian film history."

Though some art house cinemas in the past may have compromised on technical quality, such is decidedly not the case at Cinema Artis. The Meyer Sound Cinema Experience systems here are identical to those in equivalent rooms at the Cinamon complex. The system for the 180-seat screening room comprises the same trio of one Acheron 100 and two Acheron 80 loudspeakers, plus four X-800C cinema subwoofers and 12 HMS-10 cinema surround loudspeakers. The 80-seat room provides the same Acheron trio plus two X-800C subwoofers and ten HMS-10 surround loudspeakers.

## CINEMA EXPERIENCE

Meyer Sound's Cinema Experience is a complete, integrated cinema sound line offering precise coverage and plenty of headroom. Based on the Acheron screen channel loudspeakers, the line also includes surrounds, subwoofers, and electronics specifically designed for cinema applications. All elements of the system work together to deliver remarkable clarity, power, and transparency for cinema sound. Cinema Experience has been installed at Skywalker Sound, ImageMovers Digital, American Zoetrope, and the USC School of Cinematic Arts.

### Acheron 80/Acheron 100 Screen Channel Loudspeakers

Optimized for installation behind perforated screens, the self-powered Acheron screen channel loudspeakers are available in two full-range models: the Acheron 100, with a 100 degree horizontal horn, and the Acheron 80 with an 80 degree horizontal horn. (Both have 50 degree vertical patterns.) The patent-pending horn design, specifically designed for cinema, features a very soft roll-off outside the well-behaved specified coverage angle. A carefully selected 580 Hz crossover point places most dialogue in the horn for optimum clarity. The horn is coupled to a 4-inch compression driver, while low frequencies are reproduced by a 15-inch neodymium magnet cone driver. Acheron 80 and Acheron 100 also incorporate a two-channel amplifier with 1685 W (3370 W peak) output as well as an electronic crossover and correction filters for a flat frequency and phase response. Both versions are THX certified.

### Acheron LF Screen Channel Loudspeaker

The Acheron LF is specifically designed for pairing with Acheron 80 and Acheron 100 screen channel loudspeakers in larger rooms that require additional low frequency headroom. The key operating parameters of 37 Hz to 370 Hz operating frequency range and 136 dB maximum SPL were selected to ideally complement the low frequency section of the Acheron 80 and Acheron 100. The on-board, two-channel power amplifier has total output of 2250 W (4500 W peak).

### X-800C High-Power Cinema Subwoofer

The X-800C is an exceptionally powerful, linear self-powered subwoofer that offers excellent phase coherence for smooth transitioning between screen channel bass and low-frequency effects. Low frequency output extends into the subsonic region (20 Hz), with clear punchy transients even at very high levels. The X-800C houses two long-excursion 18-inch drivers in an optimally tuned cabinet, along with a two-channel class AB/H amplifier providing 1240 W (2480 W peak) of output power.

### HMS-10 Cinema Surround Loudspeaker

Designed to complement the Acheron screen channel loudspeakers, the HMS-10 incorporates a 10-inch long-excursion low frequency driver and 2-inch high-frequency compression driver on a symmetrical 80-degree horn. The wide frequency range of 55 Hz to 18 kHz and the maximum peak SPL of 126 dB with very low distortion accurately reproduce both the intensity and nuances of surround channels. Balanced audio and DC power are supplied via a single 5-pin Phoenix connector. A separate rack-mount power supply/audio distribution unit eliminates the need for AC wiring conduits while preserving the sonic advantages of self-powered loudspeaker systems.

### Galileo Loudspeaker Management System

Galileo is a hardware/software system for digital signal processing and distribution that provides all the facilities needed for optimizing the response of Cinema Experience self-powered loudspeaker systems. The complete system comprises the 6-input, 16-output Galileo along with dedicated Compass control software, which provides a flexible, high-resolution graphical user interface on a remote computer.

### MAPP Online Cinema Acoustical Prediction

A version of the MAPP Online Pro acoustical prediction program, MAPP Online Cinema combines data from the entire Acheron line with perforated screen data for reliable, accurate acoustical prediction of expected frequency response, impulse response, and max SPL output.



*“During our first two months of operation, we have hosted plays and ballet, conferences, jazz, musical theatre, as well as choral, symphony, pop, and rock concerts. The Meyer Sound systems have worked well on all of them. We have found Constellation to be a great tool not only for acoustic performances, but it also works in combination with the main reinforcement system to enhance jazz and musical shows.”*

**Priit Rebane**

Baltic Development Group  
Managing Partner of Solaris Centre



## CONSTELLATION IN THE NOKIA CONCERT HALL

### A Multipurpose Hall with Acoustics Tailored to Each Event

The keystone venue at the Solaris Centre is the 1,829-seat multipurpose Nokia Concert Hall. The first venue of its size and type in Estonia, the hall was designed to host the widest possible variety of performances, special events, and conferences. To accommodate such a wide range of uses, the venue incorporates a very large stage house and fly loft, as well as facilities for both 35 mm film and HD video projection. Also, to maintain an intimate connection between stage and audience, the auditorium places seating for over 800 on two deep balconies.

As with all multipurpose theatres of this type, the fundamental design imposed certain acoustical compromises. The stage house and proscenium couple poorly with the main auditorium, and provide no early reflections for musical performers on stage. Consequently, any use for orchestral or chamber music would require erection of a cumbersome acoustical shell.

An even more difficult challenge proved to be the design for the physical acoustics of the auditorium itself. In the past, most halls of this type had to accept a compromise acoustical characteristic, one that would be somewhat too “live” for optimum





intelligibility for plays and other spoken word uses, yet at the same time with insufficient reverberation to optimally support chamber, orchestral, opera or choral performances. The only alternative to an active acoustic system would be devices for altering physical acoustics, such as moveable drapes and rotating wall sections opening into separate acoustical chambers—measures which are inordinately costly and compromise hall aesthetics.

Before work on interior acoustics had begun, developers of Solaris Centre decided that the Constellation active acoustic system offered a superior alternative. With Constellation augmenting both early reflections and late reverberation as needed, the design of physical acoustics could be focused on creating an ideally balanced but relatively “dry” characteristic. This task was assigned to noted Estonian acoustician Linda Madalik, who provided the perfect physical foundation for Constellation with a mid-band reverberation time of slightly more than one second, and a desirable rise to between 1.5 and 2 seconds between 63 Hz and 125 Hz.

## Challenges

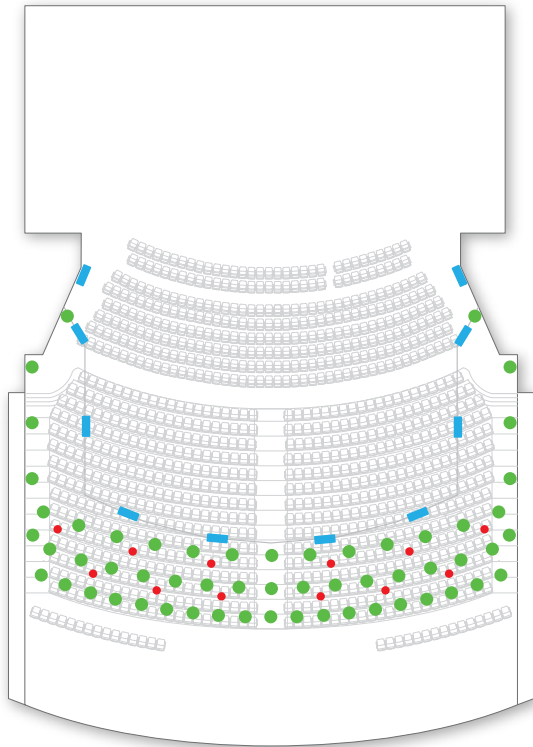
- Event types range from corporate presentations to choral concerts
- Intentionally “dry” physical acoustics not ideal to some uses
- Stage house area has no physical acoustic shell to help musicians hear each other
- Mechanical solutions unsuitable due to cost, difficult implementation, and limited benefits

## Requirements

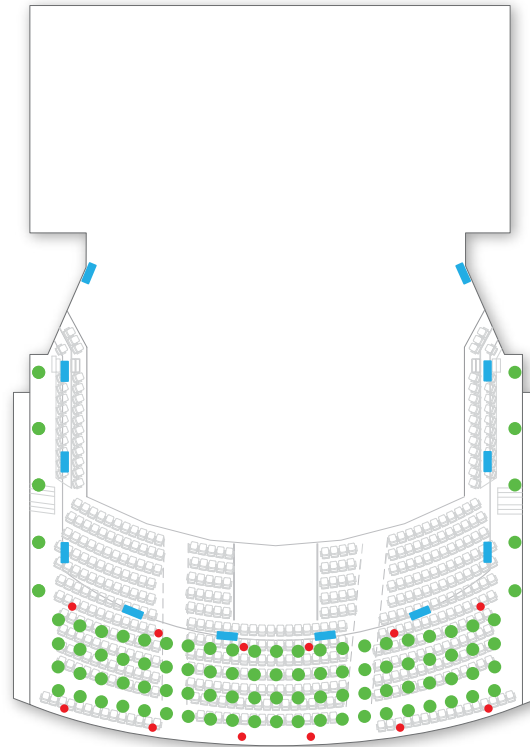
- Intelligibility for meetings, dramatic theatre
- Clarity for musical performances
- Improved audibility for musicians and performers
- Ability to easily change acoustical characteristics for a variety of events
- Integration of the active acoustic system with theatre’s main sound system
- Preservation of the hall’s aesthetics

## Benefits

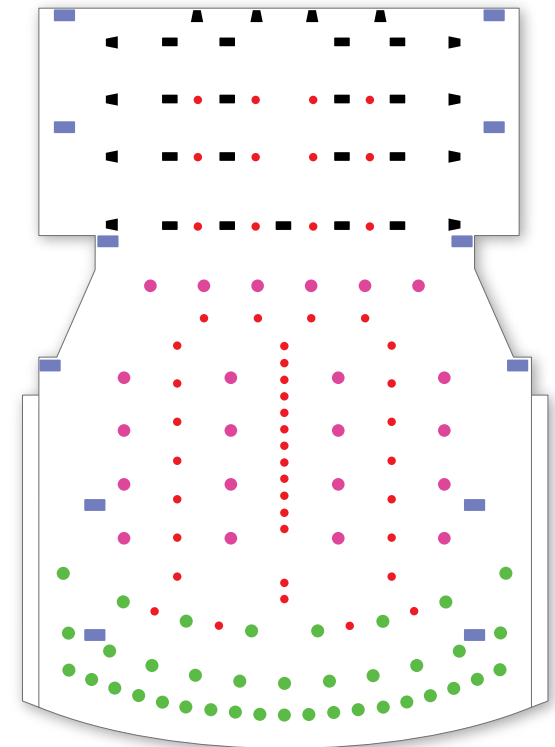
- Constellation can vary perceived intimacy, loudness, clarity, envelopment, and warmth
- Five settings for different uses
- Cinema surround sound enabled through Constellation loudspeakers
- Better interaction between performers fostered by “virtual orchestra shell”
- Expanded breadth of performable repertoire increases hall receipts
- Longer reverberation times possible with smaller room volume, reducing construction costs, HVAC costs, and energy consumption.



Under Lower Balcony



Under Upper Balcony



Upper Ceiling

#### Constellation System Configuration

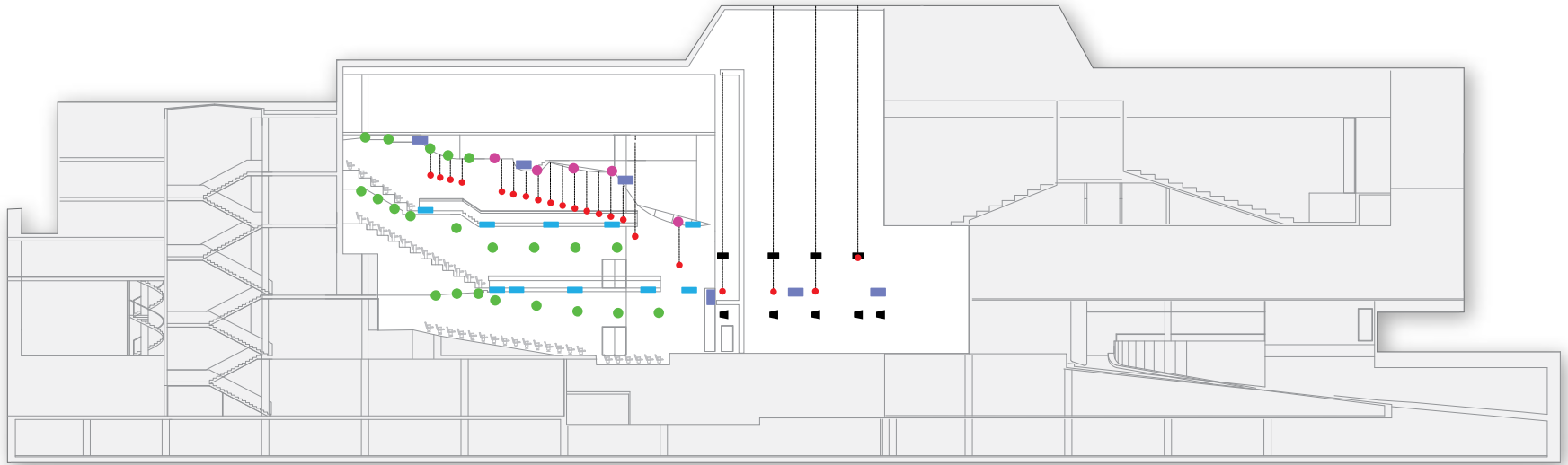
- Microphone
- Stella-4C
- Stella-8C
- UPM-1P
- UPJunior
- UMS-1P
- UP-4XP

## CONSTELLATION SYSTEM CONFIGURATION

Design of the Constellation system for the Nokia Concert Hall entailed several interrelated goals. First, and most importantly, the system would augment the physical acoustics of the auditorium, offering several options for longer reverberation times—up to around 2.3 seconds for choral and organ music. The system would also provide the Ensemble feature, a virtual orchestra shell with ample, balanced early reflections and reverberation throughout the stage area. Finally, the system had to achieve nearly complete visual transparency, with all 276 loudspeakers either recessed and hidden or color matched to their backgrounds.

### Constellation Zones

To achieve the precise acoustical characteristic desired on stage and throughout the hall, the Constellation system is segmented into six zones. Two zones on stage offering independent control of reverberation and early reflections create the Ensemble “orchestra shell” effect. The hall has four zones: house left, house right, lower balcony, and upper balcony. Each zone has its own dedicated MS-VRAS processor, with proprietary digital processing algorithms for creating natural early reflections and late reverberations as desired. The system also includes a master MS-Constellation processor and five MX-CEXP expansion processors, supplying additional inputs and outputs.



Section View

The incorporation of UMS-1P subwoofers enables Constellation to reproduce a full bandwidth reverberation envelope. The frequency balance of electronically augmented reverberation faithfully tracks the curve of the physical acoustics. This is essential to maintaining a natural room reverberation that is perceptually indistinguishable from the effect of equivalent “live” physical room acoustics.

Constellation replicates the subtle effects of natural acoustical reflections were fed into the system by 56 omnidirectional microphones spaced overhead in the hall, and 16 cardioid microphones placed over the stage.

## User Interface

The Meyer Sound Lemur touch-screen controller provides system operators at the venue with a selection of pre-programmed presets that are easily accessible with the touch of a button.

## Constellation System

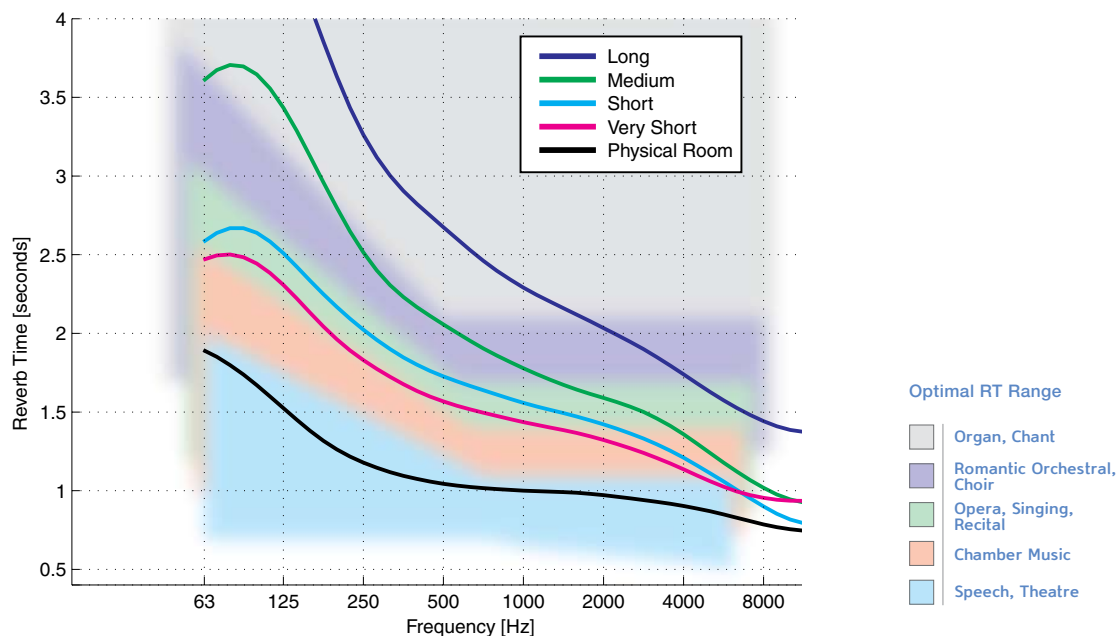
- 189 Stella-4C loudspeakers
- 22 Stella-8C loudspeakers
- 17 UPM-1P loudspeakers
- 12 UPJunior loudspeakers
- 22 UP-4XP loudspeakers
- 12 UMS-1P subwoofers
- 56 Omnidirectional Constellation microphones
- 16 Cardioid Constellation microphones
- 1 MS-Constellation processor
- 6 MS-VRAS processors
- 5 MS-Expansion processors
- 1 Lemur touch-screen controller



## Nokia Concert Hall Programming

Following is a sampling of performances at the Nokia Concert Hall in its first weeks of operation.

- Francis Goya with Tallinn Chamber Orchestra (romantic classical guitar)
- Jürgen Veber (magician)
- Evita (musical theatre)
- Nino Katamazde (jazz)
- Boriss Eifmani Ballet Theatre
- Kings of the Dance
- Bizet's Carmen live telecast from La Scala
- Dmitri Hvorostovki (classical baritone)
- Chekov's Uncle Vanya (play)
- Jean Luc Ponty (jazz-rock)
- Chaif (folk-rock)



Constellation tailors room response in terms of both reverberation time and frequency content of the reverberant field to optimize the acoustical signature of the room for each type of performance or event.

## Exceptional Flexibility

Unlike fixed mechanical systems of variable acoustics, the reverberation characteristics of Constellation can be changed at any time. New presets can be added, and existing presets modified, using the same complement of Constellation processors. However, as the programming process is an exacting procedure, it is recommended that the Meyer Sound Constellation team always assist in the procedure.

## Installation, Calibration and Tuning

At the Nokia Concert Hall, Meyer Sound's Constellation team started with the design requirements given by the theatre management and acoustical consultant. The basic system configuration was based on physical acoustics as predicted by the consultant. Since Constellation features both regenerative and in-line components, system design—especially component placement—are complex and critical. Installation by Eventech was accomplished seamlessly with best-practice professional skills and attention to detail conforming to the design.

The Meyer Sound Constellation team calibrated and tuned the system, as well as generated the presets. As with the design, calibration, and tuning are complex procedures that require highly trained and experienced staff. The Constellation team conducted these processes using proprietary methods and powerful tools, such as the SIM 3 audio analyzer. At the conclusion of tuning, standard measurements, replicable by any acoustical professional, were taken to confirm that all design goals had been achieved.



## THE OUTCOME

### Optimized Acoustics for Each Performance at the Push of a Button

Five Constellation presets are programmed by the Constellation design team to vary in their reverberation times and early reflection content. Each preset is recalled by a button on a Meyer Sound Lemur touch-screen controller. The technical management can choose the most appropriate preset from the following:

**Physical acoustics (off)** – This selection is optimum for louder amplified music, and for most spoken word applications when the PA system is used for reinforcement.

**Very Short** – This preset is appropriate for chamber music performances, and works well for musical theatre applications. With emphasis on early reflections, a very short reverb time also provides the Voice Lift feature: spoken word can be heard throughout the hall without use of the main PA system.

**Short** – This setting also works with chamber music, and applies well to solo vocal and instrumental performances, small ensembles, and opera.

**Medium** – Romantic orchestral and choral music are best served by the longer reverberation times and fuller low frequency response of this setting.

**Long** – This acoustical characteristic expands orchestral music for a “Wagnerian” effect, with deep, sonorous low frequencies particularly appropriate for pipe organ and early music chants.

*“Nokia Concert Hall has been one of the best venues we have ever had the pleasure to perform at. We were amazed by the quality of the light and sound systems. The acoustics were sensational. We can’t wait to perform there again!”*

**Nino Katamadze**  
Vocalist

*“We’ve had positive feedback already from several different artists and promoters. Constellation has allowed us to start hosting the high definition feeds from the La Scala Opera in Italy in addition to the live performances here on stage.”*

**Aivar Sirelpuu**  
General Manager, Nokia Concert Hall



### **An Opening Pleasing to the Most Critical Ears**

When the Constellation system at Nokia Concert Hall was introduced to the Estonian public with a gala opening concert, the varied musical fare for the evening underscored both the breadth of forthcoming events and the extraordinary capabilities of both Constellation and the Meyer Sound main reinforcement system. Performances for the evening included rock music, operatic aria with orchestra, and excerpts from musical theatre.

Perhaps the most critical ears to evaluate Constellation were those of Linda Madalik, the acoustical consultant who designed the hall’s excellent physical acoustics. She finds the active augmentation much to her liking. “The sound in the Nokia Concert Hall is very natural,” she says. “There are no zones of poor acoustic quality anywhere in the audience seating area. The acoustical conditions on stage are also perfect. The musicians and artists have excellent support.”

From her extensive experience, Madalik fully understands how improving the acoustics of a given space can affect not only the degree of audience enjoyment but also the creative potential of the performers. “For me, the most pleasing characteristic [of Constellation] is the ability to hear a piano being played pianissimo anywhere in the hall,” she continues. “It makes music performance much more flexible, intimate and expressive. Also, because there is no need to make extreme efforts to be heard in the back rows, musicians can focus on subtleties of expression.”

### **A Promising Foundation for a Cultural Venue**

For the management of a multipurpose concert hall, the capability of tailoring acoustics to the demands of the performance translates directly into more booking opportunities and stronger ticket sales. In a sense, each artist can choose from among five different halls, selecting the one best suited—for artist and audience alike—to that evening’s performance.

“I think it is fair to say that the Constellation system is so flexible that it benefits almost every event we have had here since we opened,” maintains Aivar Sirelpuu, general manager of the Nokia Concert Hall. “The system helps us to find the best possible acoustical solution for every event.”



## CONSTELLATION SYSTEM COMPONENTS

Constellation is a complete, fully integrated active acoustics solution that encompasses expert services along with advanced technology. Every system begins with in-depth consultations and analysis by Meyer Sound's Constellation team, and continues through system calibration and tuning.



### Constellation Processors

At the heart of every Constellation system are highly sophisticated digital processors which employ Meyer Sound's patented VRAS algorithm. The MS-Constellation processor contains the communications hardware required in a Constellation system. It receives the user's preset selections and issues the right commands to run them on the MS-VRAS processors. The MS-VRAS processor is the unique technological core of Constellation, providing powerful digital signal processing for the VRAS algorithm. MS-CEXP expansion processors provide additional inputs and outputs for the MS-VRAS processors.



### Microphones

The Constellation system utilizes precision-calibrated omnidirectional and cardioid Constellation condenser microphones, carefully placed over the stage and spaced throughout the room, to pick up both direct and reverberant sound.

### Loudspeakers

Effectively reproducing the characteristics of a natural acoustical environment requires loudspeakers of extraordinary linearity and consistency. Models used in the Nokia Concert Hall include Stella-4C and Stella-8C installation loudspeakers, UP-4XP ultracompact loudspeakers, UPM-1P ultracompact wide coverage loudspeakers, UPJunior ultracompact VariO loudspeakers, and UMS-P subwoofers.

### Lemur touch-screen controller

A Lemur touch-screen controller serves as the control interface for selecting the appropriate setting from the pre-programmed Constellation presets.



## **ABOUT CONSTELLATION**

### **A 21st Century Approach to Venue Acoustics**

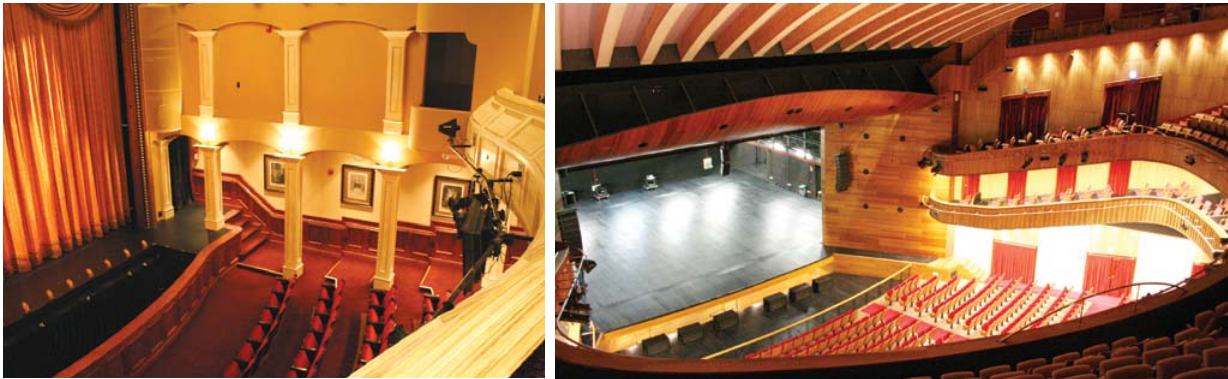
Constellation active acoustic system marks a major breakthrough in acoustical science, one that solves a challenge faced by many contemporary performance venues. In the past, performance spaces were acoustically designed for a specific purpose: theatres were optimized for plays, concert halls for music, lecture halls for speech, and cinemas for surround sound. But today's venues must cater to a wide variety of performance types and community events, and an acoustical signature ideal for one type of performance can impair the enjoyment of another. This dilemma usually resulted in compromises, with acoustics designed to be minimally acceptable for all performances, but ideal for none. Some venues attempted mechanical systems to vary the acoustics: orchestra shells, retractable draperies, and secondary chambers. But such solutions are inherently costly, can be prone to mechanical problems, and often produce mixed results.

In contrast, Constellation offers a complete solution that allows venues to immediately alter the room's acoustical signature while remaining largely invisible to the eye. The result is optimum acoustical characteristics for both the audience and the performers on stage. At a musical concert, the listening experience has the enveloping warmth and resonance of a concert hall, while a play in the same space exhibits excellent intelligibility. Musicians on stage hear themselves better, fostering superior ensemble performances. With Constellation, a venue can fill its schedule with a diverse mix of events and performances of all kinds. Constellation is scalable as well as flexible, making it suitable for venues of any size and type.

### **A Certified Solution**

Constellation is provided as an integrated, turnkey solution that encompasses the patented VRAS digital technology, Meyer Sound's long-established excellence in loudspeaker design and manufacturing, and the support of the company's highly trained staff of professionals. This approach ensures that every Constellation system is correctly designed, properly installed, and rigorously calibrated to meet all of the agreed project goals.

Experience is a crucial element in the proper design of acoustic systems, and Meyer Sound's team of specialists offers an extraordinary range of talents and skills. The Constellation team includes not only qualified technicians, but also a staff scientist with a Ph.D. in acoustics and a GRAMMY-winning classical music recording engineer. Once the system is installed, calibrated, and tuned, the user takes control with an easy-to-use interface. Adapting room acoustics to have the ideal response for any performance is as simple as the press of a button or click of a mouse.



## Adaptable Features

Constellation technology allows implementation of a variety of acoustical effects, both in the audience seating area and on stage. Some features require additional loudspeakers, microphones or processors, while others are implemented in the software presets. Of course, not all features are necessary or appropriate for every venue.

### Ensemble

Constellation Ensemble provides an electronic version of the traditional orchestra shell, improving the listening experience — and often the performances — of musicians on stage. Because it is not a fixed shape and does not require any setup, Ensemble provides increased flexibility and reduced labor costs. For events involving large or widely spaced groups of performers, such as dancers or large choirs, Ensemble ensures that everybody on the stage is enveloped in a uniform field of natural sound.

### VoiceLift

Constellation's VoiceLift feature significantly boosts intelligibility for events where the audience needs to understand presenters clearly. By augmenting the early reflections that bring presence and immediacy to the spoken word, VoiceLift ensures that every word is heard clearly without the use of a sound reinforcement system. VoiceLift enhances the clarity and impact of a speaker in corporate meetings in the same way it allows the dialogue of a high school play to be heard in the back rows of an auditorium. In more complex productions, VoiceLift can even eliminate the need for an experienced audio operator.

### Crowd Enhancement

Constellation allows everybody at an event — whether a church congregation or fans at a sporting event — to feel fully engaged in their surroundings. In church services, the reverberant field created by Constellation reinforces congregational singing, moving worshippers to a greater sense of active participation. (Unlike pure physical acoustics, however, Constellation can be turned off when it's time for highly amplified contemporary praise music.) Similarly, Constellation can enhance the sensation of crowd involvement at sporting events in venues having relatively dry physical acoustics.



*“Working with Meyer Sound has been a pure joy, and the system has been working flawlessly for the varied events of our first two months. The reactions have all been positive. As a general manager, it’s a blessing not having to worry about the PA system quality or possible problems with it.”*

**Aivar Sirelpuu**  
General Manager, Nokia Concert Hall

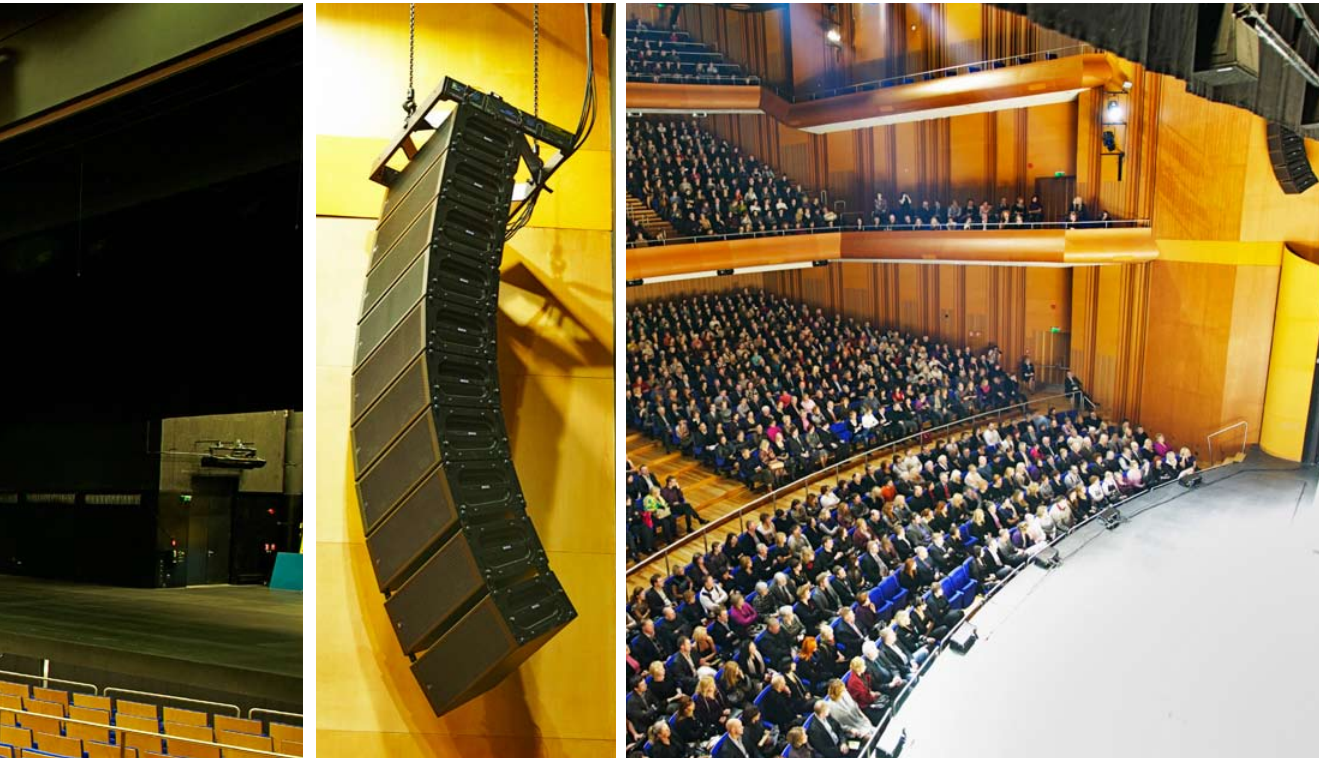


## **NOKIA CONCERT HALL: PRIMARY SOUND REINFORCEMENT SYSTEM**

The main sound reinforcement system is anchored by twin arrays of ten each MICA line array loudspeakers to the left and right of the proscenium, with an array of ten M'elodie line array loudspeakers arcing over the center. The left and right arrays provide ample power for reinforcing high-energy rock music while exhibiting very low distortion. The center array of M'elodie loudspeakers also provides ample headroom for high-decibel artists, but more importantly it affords extraordinary clarity for both spoken word presentation and the primary vocal channel in musical theatre productions.

Configured using Meyer Sound's MAPP Online Pro acoustical prediction program, the arrays uniformly cover most seats in the auditorium, with corner fill provided by a pair of UPA-1P loudspeakers. The extraordinarily versatile M1D loudspeakers are mounted as fill speaker both under the balconies and as front fill on the stage lip or pit rail, depending on staging configuration.

Bass power in the system comes from six 700-HP subwoofers. Due to physical constraints of the stage and proscenium, the subwoofers are configured in a vertical stack. To prevent excessive beaming of low frequencies, and provide uniform response throughout the room, the bottom subwoofer has zero delay, the middle subwoofer has one millisecond delay, and the top subwoofer two milliseconds delay. This time manipulation spreads low frequency response evenly across the floor and up into the balconies.



Signal delay, equalization, matrixing, and distribution are carried out by a Galileo loudspeaker management system with two Galileo 616 processors, with setup and control via the companion Compass control software. All loudspeakers in the system are self-powered, and are interconnected, monitored, and controlled with Meyer Sound's RMS remote monitoring system.

For film and high-definition video Nokia Concert Hall is equipped with appropriate projectors as well as a large screen that covers the entire proscenium opening. For 5.1 surround soundtracks, the left, center, and right arrays serve as the corresponding screen loudspeakers, with the front fill loudspeakers aligned in a special Galileo preset to bring the center dialog tracks down to center screen. For the surround tracks, a special matrix preset in Constellation creates single surround channels using multiple nearby speakers, and routes the surround signals to the appropriate loudspeaker groups.

## Challenges

- Wide variety of events and music styles
- Minimal aesthetic intrusion allowed
- Limited proscenium space for subwoofers

## Requirements

- Undistorted sound at “rock concert” levels
- High intelligibility for meetings, drama
- Adaptable to HD video and cinema surround use

## Benefits

- Self-powering eliminates amplifier racks
- Uniform response at all seats
- Rider acceptable; no need for rental systems

## Reinforcement System

- 20 MICA line array loudspeakers
- 10 M'elodie line array loudspeakers
- 2 UPA-1P loudspeakers
- 6 700-HP subwoofers
- 10 M1D loudspeakers
- 2 Galileo loudspeaker management system

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