

CASE STUDY



CHRISTMAS AT BELMONT // USA

High Channel Counts and Complex Routing Made Simple

SYSTEM SPECIFICATIONS AND CONNECTED DEVICES



STAGETEC Products

- 6 x NEXUS Base Device
- NEXUS Star Router
- AVATUS S36 Console
- 2 x NEXUS Compact
- STAGENET Gain Control

Consoles – Connection to NEXUS

- STAGETEC AVATUS / Atmos Stems Mix
 - NEXUS Network
 - 64 Ch MADI Waves SuperRack
- Yamaha PM10 / FOH
 - 192 Ch Dante
- Yamaha PM10 / Monitors
 - 192 Ch Dante
- Lawo mc2 96 / Broadcast Mix
 - 192 Ch Redundant MADI w/ SRC
 - 160 Line Out Analog Backup
- AVID S6 / Immersive Mix (Off Site)
 - 128 Ch Dante

DAW's

- TracksLive 256 Ch Dante / Venue Record
- ProTools 192 Ch MADI / Broadcast Record
- ProTools 128 Ch Dante / Immersive Record
- ProTools 64 Ch Dante / Deliverables Record

Connected Discreet AoIP Networks

- 192 Ch Dante / FOH & MON Yamaha TWINLANe
- 256 Ch Dante / Venue Record
- 64 Ch Dante / Deliverables Record
- 64 Ch Dante / Comms (ClearComm) w/ SRC
- 64 Ch Dante / Stems Control Room I/O
- 192 Ch Dante / Atmos Mix Control Room / SRC
- 64 Ch ST2110 / NEXUS Control Station I/O
- 192 Ch ST2110 / Lawo Transport POC

System Capacity

- 4096² Routing Capacity
- 224 TrueMatch Mic Converters
- 192 Line Outputs
- 56 AES3 I/O
- 960 Dante I/O
- 1024 MADI I/O
- 1792 ST2110 I/O
- NEXUS Onboard DSP for Comms Matrixing and distribution

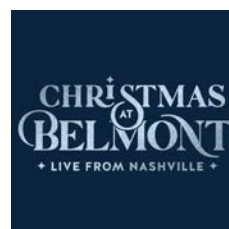
Connected Routes

- 524 Total System Inputs
- 1511 Total System Outputs
- 6 Dante Networks
- 2 ST2110 Networks
- 4 MADI Networks

ABOUT BELMONT UNIVERSITY

Belmont University is located in the heart of Nashville, TN's Music Row and is one of the premier Music and Music Business schools in the world. The university hosts the Christmas at Belmont show semi-annually to showcase their incredible student musical and technical talent.

This year's performance was broadcast on Amazon Prime and was hosted at Belmont's Fisher Center for the Performing Arts. Nearly all performers and technicians were students or alumni which is a testament to the University's ability to provide the highest level of musical and technical education.



COMPLEX AUDIO ROUTING MADE SIMPLE

CHRISTMAS AT BELMONT FEATURES MORE THAN 400 ON STAGE PERFORMERS AND OVER 160 STAGE INPUTS. STAGETEC WAS BROUGHT IN TO HANDLE THIS COMPLEX ROUTING SCENARIO BETWEEN EVENT AUDIO, BROADCAST MIX AND IMMERSIVE MIX WITHOUT COMPROMISING THE AUDIO QUALITY.



All stage I/O as well as the central router and NEXUS GUI.

No Splitters

Using the XMIC+ cards with TrueMatch mic converters and NEXUS' flexible routing, no analog splitters were required to provide signals to 5 consoles and 4 DAWs simultaneously therefore removing the signal degradation usually introduced by analog splitters. The XMIC+ card's split outputs provide up to 4 separate split outputs, each with their own separate gain, HPF, polarity and limiter parameters. For Christmas at Belmont all inputs were gained to a nominal level of -20dBFS and trims were adjusted and automated at each console. In this configuration the number of "split outputs" is essentially limitless.

Centralized Control

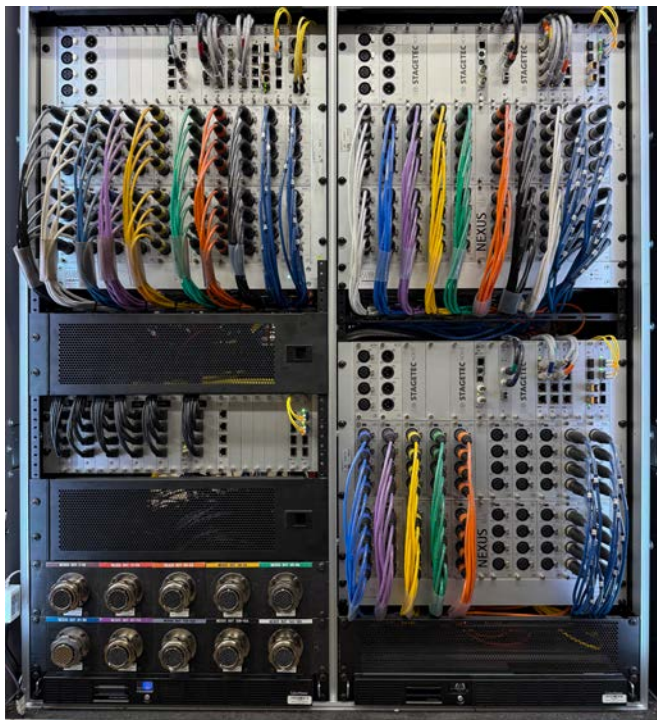
All routing was handled controlled from a single location with maximum possible redundancy. Routing changes, signal checks, snapshot recalls and virtual soundcheck could all be handled from the NEXUS GUI. The MultiMeter application allowed the patch engineer to see and adjust levels on all 160+ mic inputs from a single screen (as shown above).

Maximum Redundancy

The system was designed with redundancy as a primary focus. All audio connections were redundant along with multiple MADI feeds to the broadcast mix, as well as a level matched analog backup. STAGETEC's Star Router is able to receive MADI feeds not only with redundant TX, but is also able to monitor RX from third party devices and automatically switch routes if there is a TX failure from the source.

LARGE SCALE AoIP WITHOUT NETWORK ADMINISTRATION

TODAY'S MODERN AUDIO LANDSCAPE REQUIRES THE MANAGEMENT OF MANY DIFFERENT AOIP FORMATS. COMBINING AOIP SIGNALS FROM DIFFERENT MANUFACTURES, FORMATS AND SAMPLE RATES CAN BE IMMENSELY COMPLICATED AND REQUIRE ADDITIONAL HARDWARE FOR FORMAT CONVERSION, SAMPLE RATE CONVERSION, AND NETWORKS BRIDGING.



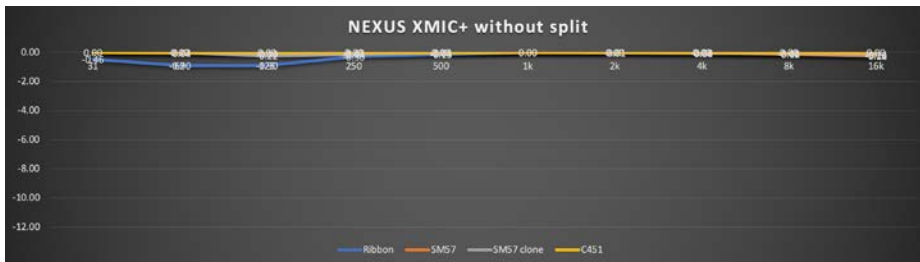
All NEXUS Stage I/O with 192 Mic Inputs, 160 Line Outputs for Broadcast mix analog backup, 3x 192 Channel Dante Networks, 192 Channel MADI and 768 Channels of ST2110.

NEXUS allowed Belmont to route audio between 8 discreet AoIP networks without the necessity for centralized control and administration of the Dante™ or ST2110 streams. Each network existed in its own LAN, invisible to the others while still routing audio through NEXUS via STAGETEC's FOC proprietary fiber optic connections.

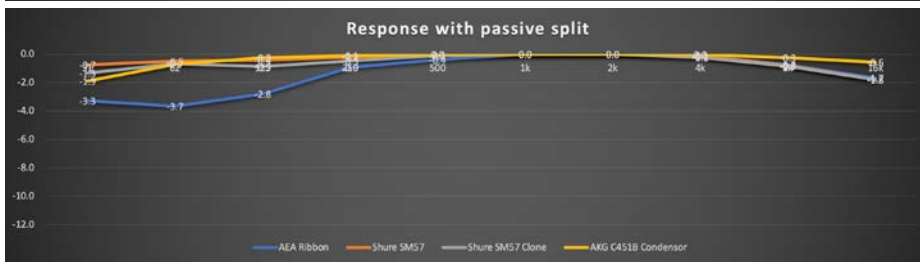
This simplified the network administration while still routing and controlling all signals from a single location with the NEXUS GUI controlling routing between all AoIP networks. Each AoIP 'sub-network' is then administrated separately with unique subnets, IP schemes and switch fabrics.

For large scale events such as live television broadcast with multiple vendors coming together in a condensed timeframe, this functionality is crucial to a smooth implementation of AoIP.

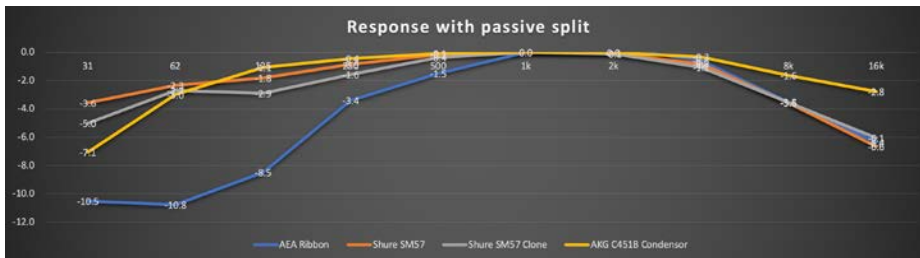
UNCOMPROMISED AUDIO QUALITY



NEXUS XMIC+ no Splitter



NEXUS XMIC+ with Splitter



Digico SD 32Bit card

Signal distribution for large scale broadcast music events like Christmas at Belmont have presented unique challenges because of the need for signals to reach different consoles for Production Mix, Music Mix, FOH, Monitors, etc.

Traditionally this has always been done with multiple analog splitters. The compromised audio quality those can cause is accepted as a 'necessary evil'. STAGETEC's TrueMatch mic converter allows microphone inputs to be split infinitely without it affecting frequency response.

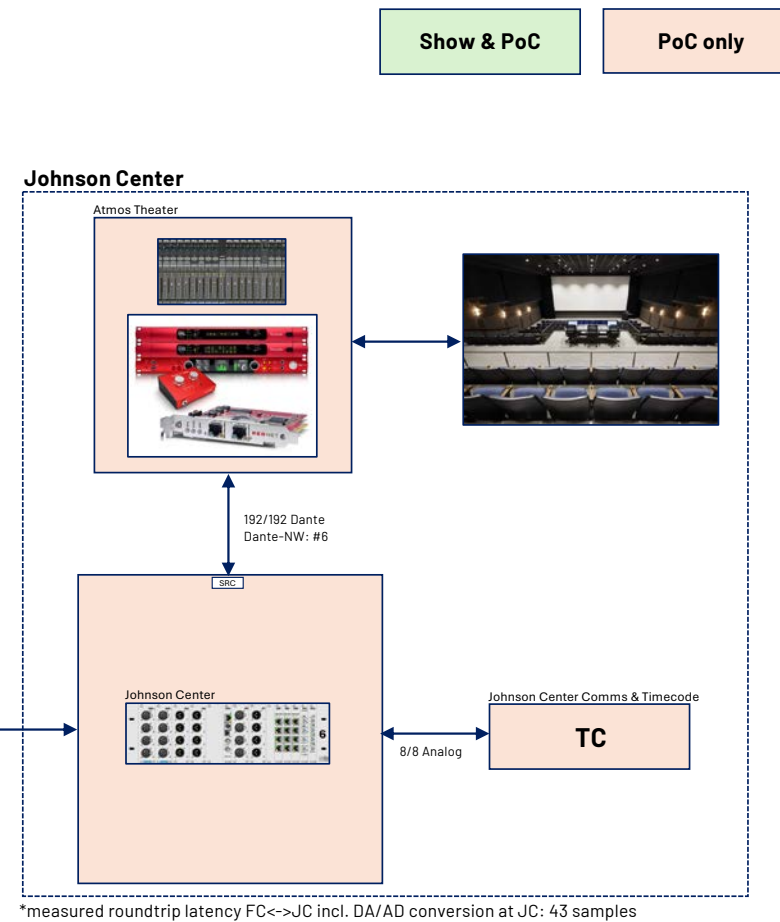
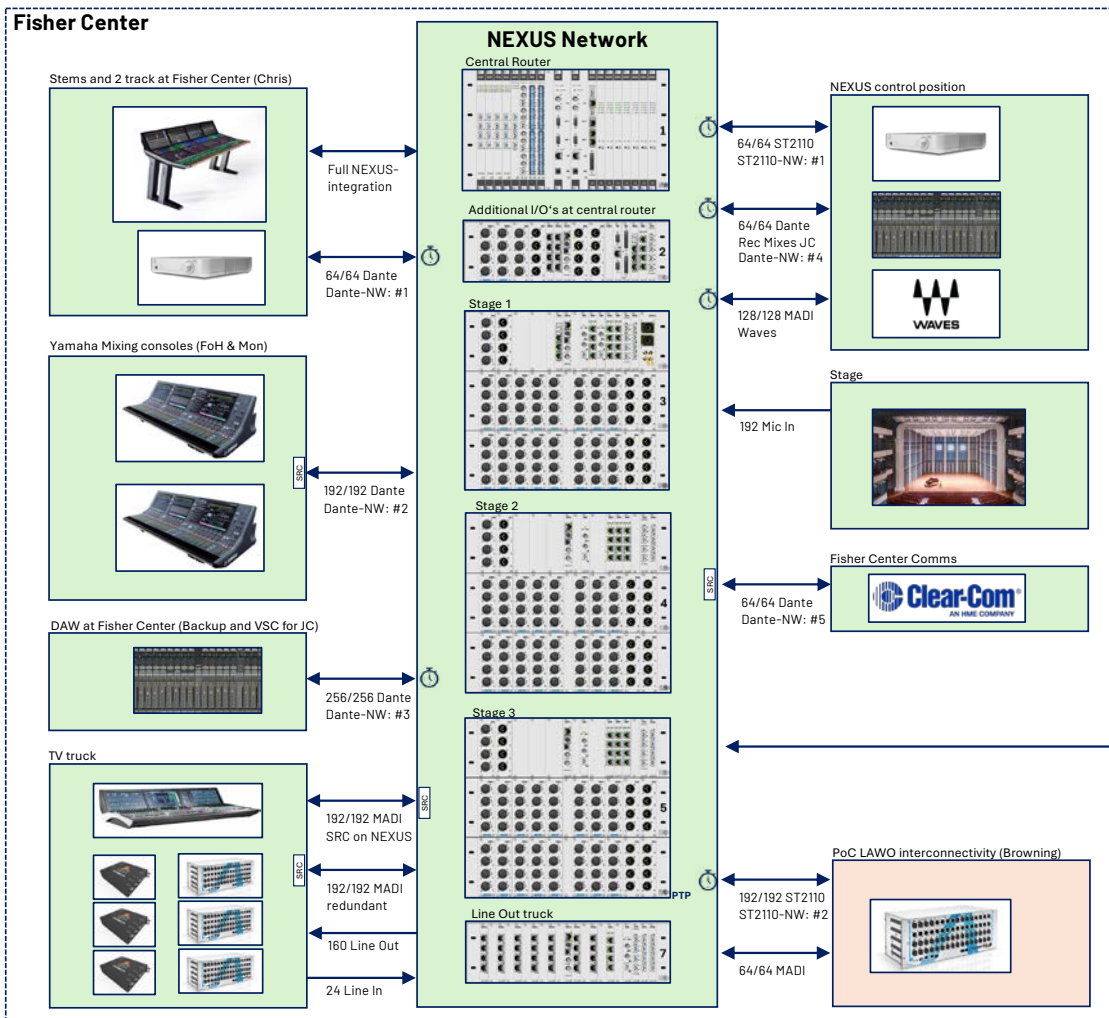
A mic pre's input impedance can drastically effect frequency response, especially when the resistance is multiplied by having multiple preamps across outputs of a splitter. The diagrams above show frequency response of multiple microphones and how they are affected by the additional load of a second preamp on a passive splitter.

The top graph shows the response of XMIC+ card when the microphone is connected directly.

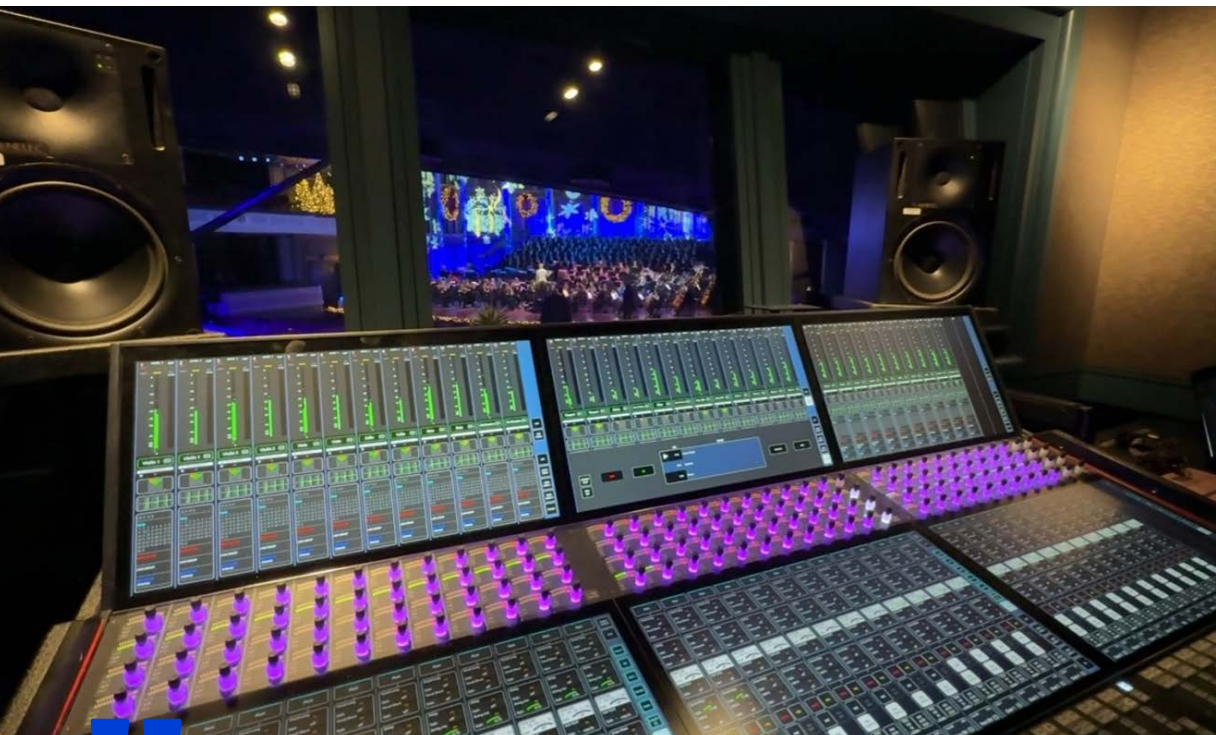
The center graph shows the frequency response when the microphone is run through a two-way passive splitter with XMIC+ converters on either side. The 12.5kΩ resistance of the XMIC+ input is multiplied, causing the high and low frequency roll off.

The bottom graph shows what happens to frequency response when a Digico SD 32bit mic pre with an input resistance of 1.7kΩ is put on either side of a passive splitter. This drastic loss of high and low frequencies is avoided by using STAGETEC's TrueMatch mic converter and bypassing splitters.





TYING IT ALL TOGETHER



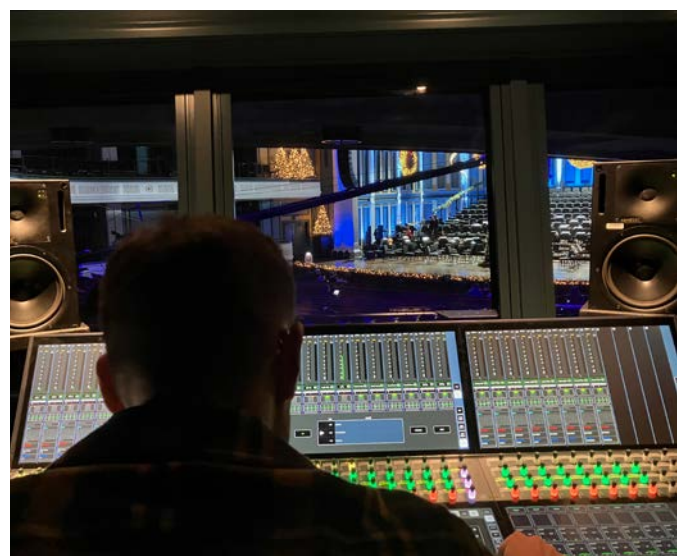
STAGETEC AVATUS
S36 Control Surface at
Christmas at Belmont

All the engineers were pleasantly surprised by the extremely low latency, the greater signal to noise ratio on each input, and the flexibility of being able to interface in any format directly into their I/O devices.

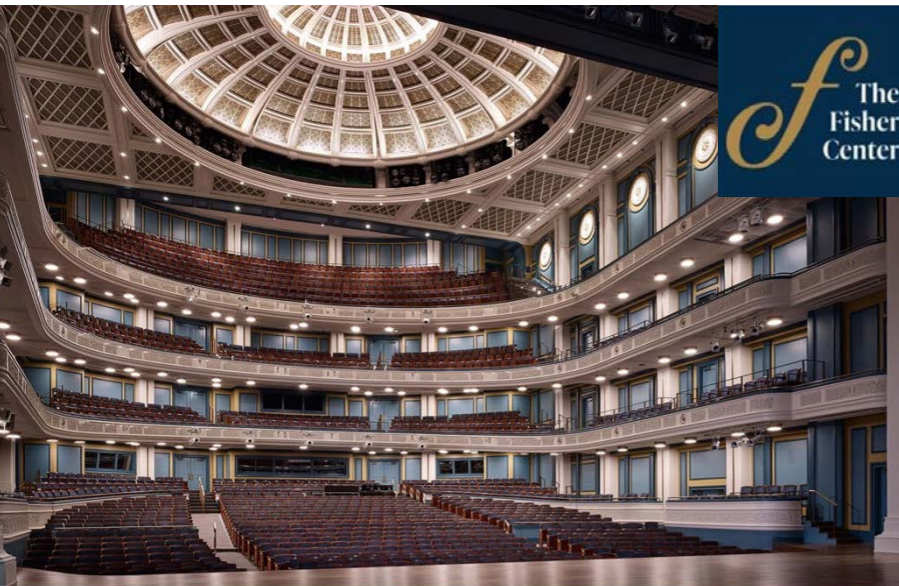
RUSTY KING // Director of Production and Facilities
The Fisher Center for the Performing Arts

A STAGETEC AVATUS S 36 Console was brought to act as a hub for the entire system. This console served two purposes: First as a control surface for gain control of all mic inputs for the system. Belmont's production team decided that because of the many different destinations for mic inputs it was best to set a unity gain for all consoles. Using AVATUS all inputs were gained to a nominal level of -20dBFS. In this scenario each engineer then used console trim to make automated level adjustments on a per-song basis. These levels were monitored by the NEXUS patch engineer Daniel Schindler as well stems mixer Chris Stephens. Both engineers worked in tandem to manage levels for each of the 21 different performances.

Secondly AVATUS mixed the 160+ input show down to 30 stems which were transmitted using STAGETEC's proprietary FOC format to another NEXUS base device at the Johnson Theater half a mile across campus for the Dolby Atmos mix on Belmont's AVID S6. 128 total channels were sent to Johnson for the Atmos mix, converted to Dante and SRC'd to the theaters clock domain.



Fisher Center for Performing Arts at Belmont University



f The
Fisher
Center



The NEXUS system extended our reach to parts of campus allowing us to educate students in ways that were never available before

RUSTY KING // Director of Production and Facilities
The Fisher Center for the Performing Arts



A LARGER PLAN

The implementation of the NEXUS system for Christmas at Belmont is part of a larger plan for Belmont to have a completely interconnected campus. NEXUS will eventually tie together dozens of venues, studios, production facilities, classrooms and labs to allow audio to be routed from anywhere to anywhere.

This will allow students to have access to inputs from events happening throughout Belmonts campus, broadening access to much needed console training time for students.

NEXUS will also connect the Fisher Center for the Performing Arts with Ocean Way Studio Nashville (which is also owned by Belmont University.) This will allow the lowest possible latency transmission between the facilities and allow live collaborative recording. Transmission latency from a microphone input at the Fisher Center to the Neve 8078 in Ocean Way a mile away will be below 1ms.

FINAL THOUGHTS

STAGETEC's NEXUS system was able to centralize and simplify Belmont's complex routing needs while maintaining the highest possible audio quality and reliability.

This event was the first step in a long-term relationship between the University and STAGETEC to make their educational and commercial goals of a fully connected campus wide audio landscape come true.

STAGETEC, in conjunction with our partners at Spectrum Sound Inc. in Nashville, Tennessee were thrilled to provide support for this event and look forward to continuing to provide unique, great sounding solutions.



STAGETEC NEXUS modular audio system managed the entire network of multiple destinations, formats, sample rate conversions and multiple production purposes. The incredibly low signal to noise ratio, amazing fidelity and less than 700us latency from 128 live inputs at Fisher Center to our Large ATMOS™ mix theater at the Johnson Center is remarkable. We see this as the solution for our entire media production program because of its flexibility, compatibility, and scalability.

JOE BALDRIDGE // Director of Operations
Ocean Way Studios Nashville and Belmont Professor

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