

# RF Coordination at the Grammy Awards

By: Mel Lambert

## Getting it right on “Music’s Biggest Night”

With dramatic changes in the available UHF spectrum, staging a complex musical event such as the annual Grammy Awards—“Music’s Biggest Night”—poses a number of unique challenges. How to accommodate so many requests for RF wireless microphones, belt packs, and in-ear monitors to enable the featured artists to recreate in a live environment the most complex of studio productions? (Not to mention intercom channels for backstage staff.) “We needed to provide around 200 discrete frequencies for the production,” recalls Grammy audio coordinator Michael Abbott, who once again oversaw all system infrastructure and changes between the A and B Stages. “We had 72 channels of wireless microphones and two dozen channels of IEMs, as well as close to 120 channels of RF intercom. The only way to have the needed RF devices work properly was to

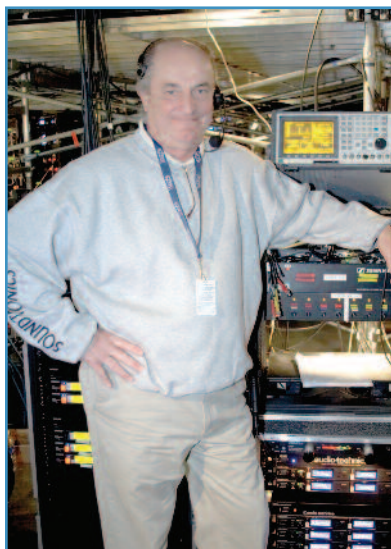
have a coordinated, zone-based coverage antenna system that provided for all on-site transmissions.”

Held in late January at the Staples Center in downtown Los Angeles, the Grammy Awards ceremony was produced by John Cossette Productions and AEG Ehrlich Ventures for The Recording Academy and broadcast by CBS Television; Ken Ehrlich and John Cossette served as executive producers, with Louis J. Horvitz the director. Hank Neuberger and Phil Ramone, from the Recording Academy’s Producers & Engineers Wing, supervised the broadcast audio, while Leslie Ann Jones, trustee of the Recording Academy, supervised the house sound. This year’s estimated television audience of 25 million people was reportedly the largest in several years.

The choice of microphones is left to the performing artists and their technical crew; such acts often prefer to use

their own hand-held and lavalier headset wireless models—if only because of user familiarity—relying on the production to provide suitable receivers. The same is true for IEMs, with artists electing to use custom-designed in-ear transducers and receivers fed from centralized transmitters. Abbott’s final request list was turned over to Soundtronics Wireless, which coordinated RF frequencies, and ATK AudioTek, which supplied the sound-reinforcement systems used in Staples Center, including stage monitors and intercoms. “If we need anything that we don’t have in our inventory, or cannot rent it locally,” says Mikael Stewart, ATK AudioTek co-owner/VP and the event’s front-of-house mixer, “we contact the manufacturers, who are more than happy to supply the required systems.”

“A frequency strategy is key to a successful event like the Grammy Awards,” says Dave Bellamy, founder of Soundtronics Wireless, the firm that regularly wrangles RF systems



David Bellamy, of Soundtronics Wireless.



Jim Fay, Matt Campisi, and Thomas Ryden, of ATK Versacom.



Elton John performs with Lady Gaga; the latter was one of several artists using Sensaphonics in-ear monitors.

for this and a large number of live broadcasts. “To prevent costly downtime and solve problems before they ever begin on site, we visited the Staples Center two weeks before the Grammy Awards. We checked out the RF environment, using an IFR spectrum analyzer to see what digital TV signals might be finding their way into the arena and other sources of electrical and electronic RF disturbances. I returned a week before the show to double-check the spectrum and start planning how to accommodate the frequencies requested for this year’s show. With its steel and concrete construction, the Staples Center arena is well-shielded from outside RF signals [within downtown Los Angeles], but we like to know what will be there. Once we know what’s in the air, appropriate mics, in-ear monitors, and intercoms are frequency-coordinated to insure a clear and successful show.

“We had a total of 209 wireless fre-

quencies in use during the Grammy Awards for hand-helds, headsets, belt packs, IEMs, and intercoms—it was a very crowded spectrum, with RF reflections from the stage sets and all those video monitors and LED displays producing a large amount of potential RF interference.” Bellamy’s RF list included 32 frequencies for one number by the punk band Green Day, appearing with the cast of the upcoming Broadway musical *American Idiot*, during a performance of the band’s chart-topping hit “21 Guns.” (The musical is slated to preview at Manhattan’s St. James Theatre on March 24, for an April 20 opening.)

#### **The custom-designed diversity antenna system**

On previous occasions, Bellamy has used Soundtronics’ patented Dual Phoenix Phase III diversity antenna system, which comprises an array of 12 Dominator antennas in the Staples Center: six along each side of the

arena, hung in the high steel and oriented towards the performance areas. “The front pairs of Dominator antennas are cross-aimed towards the center of each of the main performance stages,” Bellamy explains, “with the middle pairs aimed at the stairs leading down from the stages [around the mosh pit], while the third pairs are oriented towards the satellite stage—that way, we have complete coverage of three discrete performance zones.

“This year, we added two pairs of Widow Maker antennas, angled down from above the rear of the stage in the trussing to cover the center stage area to form a Dual Phoenix Phase IV array with ten discrete diversity zones, and relocated the front pairs of Dominator antennas to look across either side of the stage from left and right. In this way, we could turn down the gain of all of the antenna systems to enhance the overall signal-to-noise ratio of RF channels.” The Dominator and Widow Maker antennas, developed by





Wireless receivers and spectrum analyzers in Soundtronics Wireless' backstage RF coordination area.

Soundtronics, are described as high-gain, no-image, no-side-lobe designs that are optimized to operate at the target RF frequencies. The barrel-shaped Widow Maker antenna offers high forward gain and side rejection, while the longer Dominator offers a tighter field of view at RF frequencies, and is more suited to covering a smaller area of the stage.

An array of the firm's Stage 1 band-pass filters tuned out unwanted RF interference from the multi-element diversity system; a control module combined each filter output into an RF signal that passed to the banks of rack-mounted wireless receivers located in the rear stage area. IEM transmitters were located at each of the stage-left and -right monitor mixing positions.

"We assign a priority to the inner-ear monitors," Bellamy explains, "because IEMs are the most important channels—if they shut down, the talent stops singing—and then the wireless mics, PLs, and intercoms. With so many channels, we temporarily used the upper 698-806MHz band [UHF channels 52-69] during rehearsals, even though the FCC plans to shut that spectrum down on June 12. We like the UHF bands, which is fortunate, because that's where the FCC has made us work! We also had some [Audio-Technica] 944-952MHz units."

Hand-held wireless transmitters were dominated by models from Shure, Sennheiser, and Audio-Technica. Lady Gaga, Green Day, Leon Russell, Smokey Robinson, Usher, Jennifer Hudson, Carrie Underwood, Bon Jovi, and Mary J. Blige used Shure UR2 hand-held models with various capsules, while Beyoncé, Lady Antebellum, Andrea Bocelli, Zac Brown Band, Roberta Flack, Céline Dion, Jennifer Nettles, and various presenters were on Sennheiser SKM 5200 models with MD5235 or KK105 capsules, and Black Eyed Peas opted for metal-flaked Sennheiser SKM 2000 units with an MMD935 capsule; A-T supplied Artist Elite 5000 Series AEW-T5400 and AEW-R5200 dual receivers for Maxwell, Drake, Jamie Foxx, T-Pain, Stevie Nicks, and Lil Wayne, plus an AEW-T4100 for Taylor Swift. IEMs included a number of the popular Sennheiser ew300iemG2 and 3000 Series. Hardwire mics included a Neumann KMS 140 condenser for Dave Mathews, plus Sennheiser Evolution Series e602 models on floor toms and kick drums; e904s on rack toms; MKH8040 for overheads; MD421 for toms, horns, and bass amps; and MKH416 as audience mics.

Audio-Technica's new AT4050ST stereo condenser mic and AT4081 bidirectional ribbon mic also covered

backline sources, in addition to AE5400 cardioid condensers for backing vocals and horns, ATM350 clip-ons for strings, and AT4050s for guitar and bass cabinets. Elton John, who performed with Lady Gaga, used a hard-wired AE6100 hypercardioid dynamic mic.

Pink's water-soaked, ribbon-clad performance was enabled with a Sennheiser SKM 2000 transmitter fitted with a new dynamic capsule. "We prefer a dynamic capsule, because it reduces pick-up from the speakers, with less feedback," explained Horst Hartmann, the artist's monitor engineer. "The results sound fantastic!" Pink also used Sennheiser G2 IEMs, with a condom-wrapped body-pack for added water protection. "We like the high-power 100mW performance of the 2000s," says Ryan Cecil, the Black Eyed Peas' monitor engineer, "because they deliver a clean and clear sound with no wireless issues."

This year, all celebrities presenting from the Staple Center's satellite stage used a Sennheiser SKM 5200 wireless handheld mic with Neumann KK 105 capsule. "The decision to use 5200 handhelds resulted from discussions between myself, [broadcast mixer] Tom Holmes, and Dave Bellamy," says Abbott. "The Sennheiser mics are robust, offer great RF performance, and sound excellent. That's an award-winning combination!"

The extensive intercom system was installed and overseen by ATK Versacom, with Soundtronics and ATK staff coordinating RF frequencies. "We used a number of Telex BTR-800 two-channel UHF wireless intercom base stations [with full-duplex belt packs] and HME Pro850 two-channel intercom sets," recalls Matt Campisi, ATK Versacom's supervising engineer. "We totaled 18 base stations with four coverage zones, including stage left and right, plus the loading dock. Frequency coordination was a key safety element for us. After all, if there is interference on a critical RF link to the stage manager, for example, he might not

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hear a vital warning," with inevitable results. A major problem for any show like the Grammy Awards is the constant threat of unapproved wireless devices—news groups, second-unit camera crews, etc.—coming into the venue and causing interference.

Campisi, who was responsible for all integration of wired and wireless intercoms into the digital Riedel mainframe on the main event floor, was assisted by Thomas Ryden, who was responsible for operation of all wireless PLs, and Jim Fay, who was responsible for

deployment and monitoring of wired intercom stations; the general manager and intercom system designer for the event was John Arenas, who was in charge of integration for all the mobile production trucks and portable intercom positions.

### **The front-of-house sound reinforcement system**

According to ATK AudioTek's Stewart, "Our pair of identical Yamaha PMD1-D digital production consoles for front-of-house is now close to 10 years old

but is holding up extremely well."

Music mixer Ron Reaves provided various mix elements from the performance stages—basically a stereo/L-R music submix, subwoofer/LFE mix, and a vocal stem—which Stewart combined with announcer mics, pre-recorded segments, and other elements to prepare the final stereo sound-reinforcement mix.

ATK provided a four-cluster configuration of JBL VT4889 line array cabinets, augmented by a single set of JBL VT4880A ultra-long excursion subwoofer arrays flown above the center of the stage area. All cabinets were powered by QSC PowerLight series amplifiers via XTA Electronics DP226 processors, which provided system EQ and signal routing. Rear seating areas were covered by three clusters of VT4889 cabinets, with 12 ATK C-6 three-way cabinets as side-facing fills for upper loges. The main stereo mix fed the inner pair of four VerTec line arrays, with a separate mono mix to the outer pair, plus a delayed mono feed to the rear and side cabinets. Since they were hard to reach, an array of 24 QSC PowerLights delay clusters, located on a flown platform above the front-of-house position and camera platform, were connected via a CobraNet-based fiber Ethernet network for signal distribution and control. Mike Parker and Tom Pesa helmed another pair of PM1-D consoles for stage-monitor mixing. "It all went like clockwork," Stewart recalls.

Signals from the wired and wireless microphones, plus line-level sources, exited the stage area to three primary destinations: front-of-house consoles, monitor consoles, and the pair of Music Mix Mobile remote trucks being used to prepare the 5.1-channel music mix for the broadcast audience; announce and audience-reaction microphones were routed directly to a separate Denali Summit video production truck, where Tom Holmes prepared the final surround-sound TV mix. Stage sources were swapped between acts, using a system of quick-connect multiway connectors



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and stage boxes located on the drum risers and linked to a switching center located backstage.

### The split system


ATK AudioTek provided all analog I/Os and splitters. According to Jeff Peterson, a member of ATK's sound crew overseeing system rigging, "This show uses four of ATK's universal four-way/56-pair splitters, plus a trio of three-way/16-pair line-level splitters. Each performance stage has a dedicated 56-pair splitter for band inputs. Each break-out box on the band risers formed part of ATK's split system and featured 28 XLR-type connectors, wired as either Pairs 1-28 or 29-56; a 56-pair jumper between the two means they can be located separately.

"Each performer setup is dictated by the band's input requirements; normally, each band has multiple rolling platforms with pre-set drums, amps, keyboards, etc. that are miked and cabled during set-up and sound check. The carts and their respective mics are left as intact as possible, connected to the 28-input boxes; a pair of input boxes live with each band setup. When the band carts roll on to pre-set, the audio connection is made from the pair of input boxes back to the splitter system via a single 56-pair cable—which is how the audio crew was able to change over between bands so quickly."

The remaining pair of 56-pair splitters was linked together to provide a total of seven splits of the production elements, including wireless mics, podiums, etc. Each monitor console took their respective stage's band split, plus a split of the production elements. The production front-of-house console, helmed by Stewart, took another split of the production elements, plus splits of all the playback sources generated from the production truck. The front-of-house music console, helmed by Reaves, received a feed from both band splitters for all the performance inputs, plus a split of the production elements. The pair of M3 music-mix trucks used an array of Grace M802 and Aphex 188 remote-controlled

eight-channel pre-amps fed by from both band splitters, with a MADI link transporting the digitized signals.

"The secret to successful shows like the Grammy Awards is: Anticipate everything, and don't make any guesses," concludes Soundtronics' Bellamy. "We have been handling the show for a number of years, but there is always something that comes up at the last minute and surprises you. But we know how to wring the most out of the available RF spectrum and, with the use of our custom antennas, can

ensure reliable operation for such high-visibility broadcasts. Preparation is the key to success." 

*Mel Lambert has been intimately involved with production industries on both sides of the Atlantic for more years than he cares to remember. He is now principal of Media&Marketing, a Los Angeles-based consulting service for the professional audio industry, and can be reached at [mel.lambert@MEDIAandMARKETING.com](mailto:mel.lambert@MEDIAandMARKETING.com); +1/818.753-9510.*

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