Q&A with Kevin Barry
on Frequency Scanning at *Company*

Ever wonder what it's like to ensure mission critical fidelity of your wireless DMX system every night for a Broadway show? We talked to Kevin Barry, Production Electrician for *Company*, which opened at the Bernard B. Jacobs Theatre in New York City on December 9, 2021. Here's what we learned about his experience using tools like RadioScan® Spectrum Analyzer to scan local frequencies in real time to optimize the performance of his Multiverse wireless DMX/RDM system during each production.

Q&A:

City Theatrical (CTI): What were you looking to do with RadioScan Spectrum Analyzer technology for your show, *Company* on Broadway?

Kevin Barry (KB): We wanted to get the RadioScan antenna on stage, to detect any possible radio interference that may affect our wireless DMX hardware where it is installed, but then monitor the activity to the antenna from the lighting booth. Since RadioScan uses a USB connection, that was not possible. So we created a workaround using RadioScan, Virtual Here software, and Raspberry Pi.

CTI: How would you describe your current RadioScan / Virtual Here / Raspberry Pi setup for *Company*?

KB: We currently have Virtual Here software running on a Raspberry Pi 3 B+, which has the RadioScan Spectrum Analyzer's antenna plugged into it on stage. I designed a 3D printed mount for the antenna, which is available on thingiverse.com, and the Raspberry Pi and the RadioScan antenna live on the back of a Boom Stage Right at the Jacobs Theatre. It is located near our Multiverse Transmitter, so I can scan for any interference and to make sure we are outputting 2.4GHz and 900MHz. (See page 3 for a diagram of the setup.)

This setup makes the RadioScan antenna available through a client software that runs on a dedicated PC in the booth. This way, my Head Electrician Barbara Bartel can use RadioScan as an effective tool to troubleshoot the extensive wireless DMX system on *Company*.

We've found that the whole system works much better when it has a wired Cat 5 connection at the Pi end and the PC end, however, I have used Virtual Here software over a robust Wi-FI service to move the RadioScan antenna around the theater to do discovery.
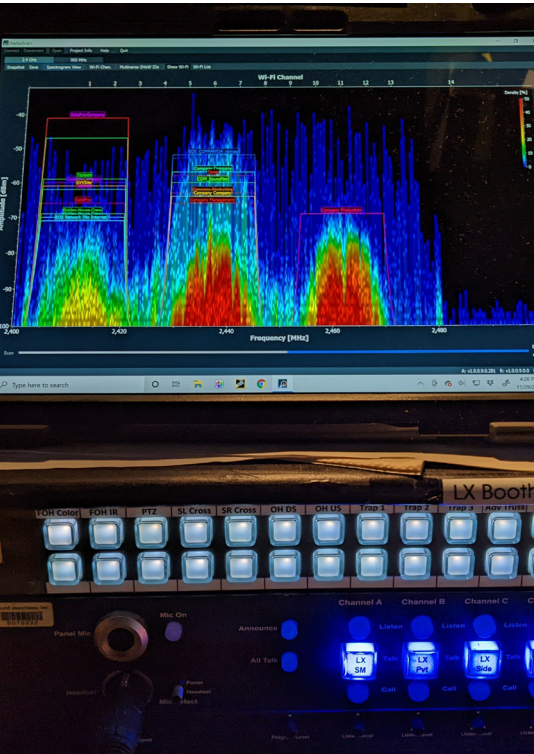
Photos by Brinkhoff Moegenburg

> **"With over 14 Multiverse receivers running nine universes of wireless DMX, much of the lighting system on *Company* relies on the wireless DMX system. RadioScan is easy to use and I will continue to put it on shows that have significant and system critical wireless DMX components."**
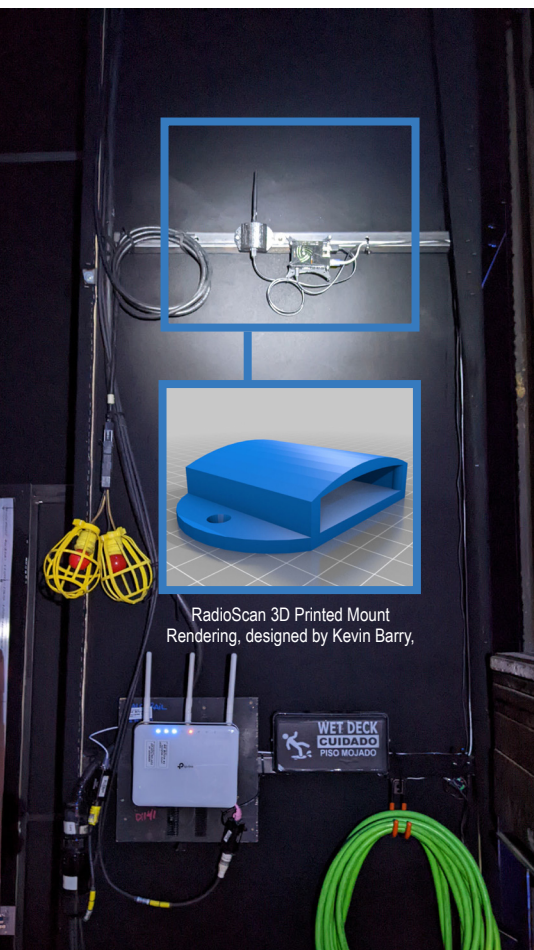> - Kevin Barry, Production Electrician

RadioScan software showing scan of 2.4GHz band during a performance of Company on Broadway. Photo courtesy of Kevin Barry.

RadioScan 3D Printed Mount Rendering, designed by Kevin Barry,

In situ RadioScan antenna photo courtesy of Kevin Barry.

CTI: What part does Raspberry Pi play in this system with RadioScan?

KB: Raspberry Pi's are low cost, tiny computers that are perfect for purpose built projects like this. "Virtual Here" is software that runs on the Raspberry Pi. It creates a remote USB server that can be accessed from another computer running "Virtual Here" Client software. The Client Software treats the Remote USB Server like it is a USB device plugged in locally.

CTI: How often are you running this RadioScan setup?

KB: Before *Company*, I only used RadioScan when we had issues or to do a wireless DMX survey. At *Company*, we are now running RadioScan all the time, during show time and checkout.

CTI: Does RadioScan allow you to foresee issues during a show, or fix issues as they occur?

KB: Both! We use it to see any 900MHz and 2.4GHz interference and to watch traffic.

CTI: How are you using 900MHz vs. 2.4GHz in your Multiverse broadcast? Do you switch between as necessary?

KB: At *Company*, we use both frequencies because we need nine universes of wireless DMX via the Multiverse Transmitter 900MHz/2.4GHz (P/N 5910). We also have a separate Multiverse Node 900MHz/2.4GHz (P/N 5902) set up as a transmitter for a couple of cue lights.

Due to the nature of the set, it requires a lot of wireless DMX.

CTI: Are there any disruptions to your wireless DMX broadcast that your RadioScan setup has helped you find?

KB: We had a huge disruption during previews at the beginning of the COVID era. We think it was due to TV news trucks on 45th Street, broadcasting in a theater next door due to a COVID case. As soon as the TV trucks were gone, our wireless DMX system was fine. This is what led me to implement RadioScan fulltime. The only issue we encountered upon implementing RadioScan was needing the screen in the booth next to my Head Electrician, Barb Bartel, while also wanting the antenna to be on the deck stage level where the Multiverse Transmitter is located.

We still occasionally see some small disruptions in signals. Some of those have been alleviated by using panel antennas and by raising our Multiverse Transmitter slightly. We continue to make small improvements in the system.

CTI: Any thoughts on how Virtual Here software, Raspberry Pi 3 B+, and RadioScan hardware/software work together?

KB: This RadioScan setup has been a game changer for us. Now we can easily put the antenna where it needs to be, close to the transmitters and receivers by the stage, and put the display such that the Head Electrician can see what is happening from the booth. Before we implemented Virtual Here, we were only able to see what was happening within the booth, not where the real action is on stage.

CTI: What was your process like to figure out how to make the connection?

KB: Virtual Here has excellent installation instructions on their website. It doesn't need any USB drivers, just a Raspberry Pi and an SD Card. We first implemented Virtual Here on a Raspberry Pi zero over a Wi-Fi signal but found that this did not work reliably due to poor Wi-Fi performance. We then moved it onto a Raspberry Pi 3B+ and connected it over the wired Internet network in the theater. This was immediately much more stable and once you launch the Virtual Here client on a computer, then RadioScan plugged into the Pi immediately pops up as a USB device. Any USB device works the same.

The cost of Virtual Here is a onetime $49 purchase and it lets me connect to the Raspberry Pi for

$35 over a Local Area Network. We are able to connect from different computers on the LAN but only one at a time. There is also the capability to see the USB device through the Internet, but it requires another subscription service or VLAN.

CTI: In your opinion, is how you're using RadioScan now a model that can be used on other Broadway shows?

KB: I think it is the way I will implement it in the future. It is nice to do a wireless DMX site survey when you tech a new show, but it is an ever evolving wireless DMX environment. It is a relief to have a tool that gives me some real time information when something unexpected happens with the wireless DMX system. Without wireless DMX tools like RadioScan, we are just working in the dark, with no information at all.

We use a unit we call a "Wireless Canary", which is simply a wireless dimmer or transmitter/dimmer combination that we place in the booth near the operator. We give it a unique DMX address and we program a chase in the console that runs throughout the whole show. This way, we know if the wireless DMX system is working properly. We usually try to have one "Canary" for each Show ID, to help track any interference and to give us confidence that the transmitter is working through the entire show.

CTI: If a technician is not familiar with Raspberry Pi, did you test any other ways to get the RadioScan remoted with off the shelf components that don't require programming?

KB: I have not tested it, but it might be possible with a USB extender or some KVM devices. A lot of other KVM solutions won't work with USB drivers and the cable lengths required may be prohibitive. I was looking at all of these options when I found "Virtual Here". The installation directions are really well documented even for a novice. The entire VH image goes onto an SD card and it is ready to configure.

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Diagram courtesy of Kevin Barry

CTI: Any thoughts on RadioScan technology in general?

KB: RadioScan is an affordable tool that has been missing from my toolbox for years. Other spectrum analyzers are either extremely expensive or cumbersome to use. With over 14 Multiverse receivers running nine universes of wireless DMX, much of the lighting system on *Company* relies on the wireless DMX system. RadioScan is easy to use and fits in my budget. I will continue to put it on shows that have significant and system critical wireless DMX components, to give my team real time information about the wireless environment around the theater.