Frequency Spectrum Analysis & Wireless Microphone System Project Specification

for the Voorhees Theater

Ixchel Disla – Department of Entertainment Technology

Introduction

This project seeks to explore software's and equipment to improve and replace the current wireless microphone system in the Voorhees Theater. The document was delivered as purchase proposal, that illustrates the complete description of the equipment's functionality and performance details. In addition, this project went through the process of qualifying and analyzing the radio frequency spectrum in the theater. This helped us determine the spectrum efficiency to ensure a reliable wireless system, obtain solid RF performance and in turn avoiding interference problems.

We also recommended a wireless system that has frequency bands that are compliant with the FCC regulations that come into effect in July 2020 in the United States. The FCC or Federal Communications Commission is an independent agency of the United States government that regulates communications by radio, television, wire, satellite, and cable across the United States.

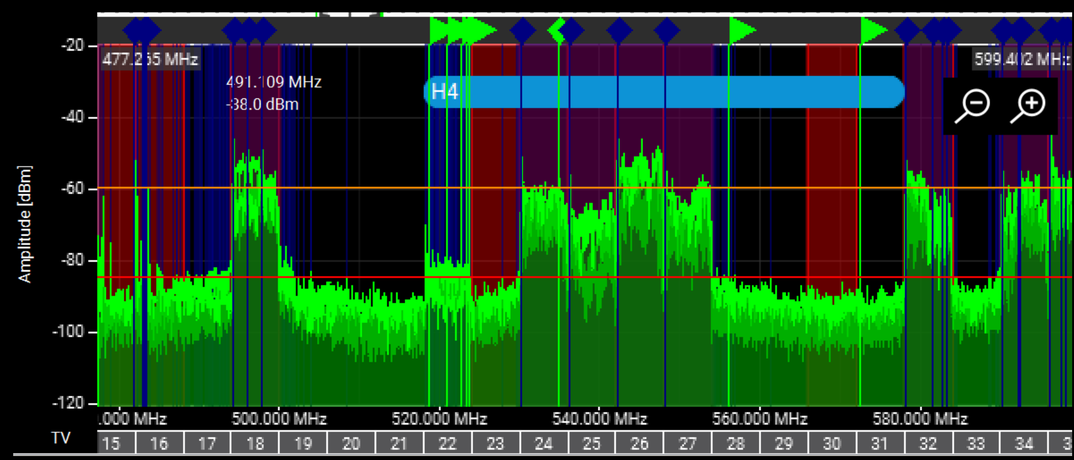
The skills included:

1. Wireless Workbench Management
2. Deep Radio Frequency Understanding
3. Ability to Scan and Analyze a Spectrum using high tech equipment and software's

The Process

To complete this project I first had to introduce myself to the great world of radio frequencies. I did so by studying various articles that expand on the subject. Once I had a basic understanding of its functionality and handling, I started looking for equipment with which I can measure these frequencies in a space and then manage this information in a frequency coordination software called Shure wireless workbench. Then I picked a digital wireless microphone system that worked best for the theater. The main objective behind this project was to learn how to adapt any space to function properly with wireless equipment, very frequent action in touring shows and other types of artistic presentations.

Voorhees Theatre RF Scan



Work Breakdown

March

- ✓ Rebuild Current System
- ✓ Quarantine Pause
- ✓ Project Reassessment

Part 1 Spectrum Analysis

- ✓ Research
- ✓ Talk to Experts
- ✓ Study Basic Radio
- ✓ Webinars
- ✓ Frequency Spectrum Analysis

Part 2 Project Specification

- ✓ Identify best working ranges for Mics
- ✓ Build New Systems
- ✓ Find Components
- ✓ Write Purchase Proposal
- ✓ Purchasing Request Sheet

Deliverables:

1. Rebuild of Current System
2. Video Interview with Wireless System Expert: Josh Flower, Jet Wireless
3. Frequency Coordination and Frequency Proposal for Existing Wireless System
4. Purchasing Proposal for New System Wireless System
5. Purchasing Request Sheet
6. Start Guide on Workbench Capabilities for future student

Result: Proposed System

The Axient digital wireless system will allow up to twice as many compatible microphones in the same RF footprint as our current analogue system. Additionally, there is an increase in the available frequency range - Axient gives you the entire 166MHz range, whereas with the UR4D we had to choose a range in roughly 60MHz increments.

This new system has several features that can only work for our advantage. To illustrate, it brings a wireless solution to overcome interference by automatically determining and loading backup frequencies to overcome interference, it also has the ability to register Axient Digital transmitters with the receiver, it takes the best of both antennas all of the time, while our current system is only taking an "either A, or B" approach, and it has many diversity modes, like the hi-density mode that allows many channels to operate cleanly within a limited block of spectrum, for instance, if we have 6 MHz open television channel available, up to 47 active transmitters can be used, with much closer spacing of the frequencies.

Conclusion

All the elements presented in this proposal build up a wireless microphone system that can represent us. The purchase of a new wireless microphone system is both relevant and needed. Sooner than later we will not be able to work within the small range our current system offers, and this will keep us from delivering clear and consistent high-quality audio to our audience.

Acknowledgements

- John Huntington, Technical Advisor
- Keith Rubenstein, Feedback
- Ryoya Terao, Faculty Advisor
- Josh Flower, Jet Wireless, Guidance
- Friends & Family, Unconditional Support