



# Public Safety Communications sees Major Advancements for Manufacturing with Cel-Fi QUATRA RED



## SUMMARY

### CHALLENGE

- State-of-the-art electric vehicle manufacturing facilities under construction needed to meet fire safety code requirements
- Remote location and building materials inhibited public safety or cellular signals from entering two buildings ranging in size from 200,000 to 600,000 square feet

### SOLUTION

- Cel-Fi QUATRA RED
- Cel-Fi QUATRA 4000

### RESULTS

- Compliance with public safety regulations required for a Certificate of Occupancy
- Reliable cellular coverage throughout the buildings for all four major carriers



## THE CHALLENGE

State-of-the-art manufacturing facilities were under construction in an area outside Tucson, Arizona that was previously farmland. One building was 200,000 square feet and a second building was 600,000 square feet. As the facilities were built with steel, they were essentially giant Faraday cages which, combined with the remote location, meant public safety and commercial cellular signals could not penetrate into the two buildings.

During the inspection of the facilities for a Certificate of Occupancy, the fire marshal noted an Emergency Responder Radio Communication System (ERRCS) was required to meet public safety regulatory requirements due to the size and construction of the buildings. It was also apparent during construction that poor cellular reception throughout the facilities would require a cellular amplification solution. As public safety regulations dictate that ERRCS systems must be separate from other cellular solutions, two independent systems needed to be installed.

Powernet, an Ohio-based provider of public safety and telecommunications equipment and services, was brought in to provide the ERRCS system the facilities required.

"When we started installing the ERRCS system, the walls inside were just going up. There



- Established in 1992
- Based in Cincinnati, OH
- Services include SIP Trunking, UCaaS, Internet/Wi-Fi, Managed Security & Network services, Contact Center solutions, Cell & Public safety signal boosters, and full-service MDU packages
- Customers include government, education, health care, hospitality, and public safety



was good reception from all carriers outdoors, but signal dropped completely as soon as we came in the building, so we let them know at some point they would also need a cellular booster,” says Jose Morales, System Engineer at Powernet.

“Powernet offers turn-key services for both public safety and commercial cellular booster solutions including design, testing, installation and support. Our engineers do all the FCC registration and we make sure everything is up and running, including doing all the testing with the AHJ.” says Penny Thurnau, Vice President of Channel & Strategic Alliances at Powernet.

## THE SOLUTION

### ADDRESSING PUBLIC SAFETY WITH CEL-FI QUATRA RED

To comply with the AHJ’s requirements for a Certificate of Occupancy, Powernet chose to install Cel-Fi QUATRA RED Class A 700MHz/800MHz channelized Emergency ERRCS Smart Signal Booster. It is the first ERRCS that is able to boost both LMR and FirstNet signals.

“We chose solutions from the Cel-Fi QUATRA family of products as we’ve installed them at other facilities. They have a public safety and enterprise system that we knew would deliver strong gain with excellent coverage, be fast and easy to install, and would cost less than a traditional DAS – all important factors for the client,” says Thurnau.

Where other ERRCS solutions require integrators to purchase different elements from a variety of vendors to create a complete solution, Cel-Fi QUATRA RED simplifies the deployment by offering an all-in-one solution. It includes everything from the head end (Network Unit or NU), remotes (Coverage Unit or CU), Master Battery Back-up Unit (MBBU), Remote Annunciator, Emergency Power-off Switch (EPO), coverage measuring tools and comprehensive remote management. Each component was built around the International Fire Code (IFC) and National Fire Protection Association (NFPA) standards, is NEMA 4X rated and fully compliant with UL2524, and are all optimized as an integrated solution.

The Cel-Fi QUATRA product family uses proprietary Cel-Fi smart booster technology that is approved for use by more than 200 carriers around the world. When QUATRA RED is installed, the technology intelligently delivers the same strong signal to all emergency responders inside the facility regardless of where they are located in relation to the system head-end or macro high site.



The system also simplifies the testing process, ensuring it passes the inspection done by the Authority Having Jurisdiction (AHJ). Cel-Fi QUATRA RED is the first ERRCS solution that includes built in uplink grid testing along with downlink grid testing. The Cel-Fi Compass handheld receiver tool is used to record the measurements on a 20- or 40-grid and input the data into the Cel-Fi WAVE PRO cloud-based management system that produces a formal report for the AHJ’s Certificate of Occupancy or annual fire safety inspections. Using the testing tools can save considerable cost, and it speeds up the certification process by eliminating the need for the AHJ to return multiple times to redo tests.

A single Cel-Fi QUATRA RED system will cover up to 1,200,000 sq ft, and multiple systems may be combined for even larger projects. Powernet installed one Network Unit (NU) which is the head-end of the system, in each building. With the exception of the remote antennas, all head-end system components were installed in the ground floor stairwell areas, which are fire rated, in each building.

The Monitor & Battery Backup Unit (MBBU) provides constant direct current, alarming, monitoring, and battery charging capabilities. It integrates a wireless LTE modem and a wired Ethernet port for remote access to all the Cel-Fi QUATRA RED components via the Cel-Fi WAVE Portal or the WAVE PRO app.

The Cel-Fi QUATRA RED Remote Annunciator Panel provides automatic supervisory signals for any malfunctions of the ERRCS system. Designed to prevent inadvertent



Network Unit (NU)	Coverage Unit (CU)	Monitoring and Battery Backup Unit (MBBU)	Remote Annunciator Panel (RA)	Emergency Power-Off Switch (EPO)
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operation, the QUATRA RED Emergency Power-off Switch can instantaneously shut down the ERRCS solution from a single point to eliminate the risk of combustion caused by electricity or static.

Powernet installed a total of 4 Coverage Units (CUs) connected to service antennas in the 600,000 square foot building, and 3 CUs in the 200,000 square foot building. Paige GameChanger Ethernet cable was used to deliver lossless signals from the NUs to the CUs utilizing Power over Ethernet (PoE). The PoE architecture allowed for a quick installation and alarm configuration. Powernet installed a single donor antenna on the roof of each building to receive the Land Mobile Radio (LMR) signal from the closest high site.

"The tools included with Cel-Fi QUATRA RED made the installation quick and painless," says Morales.

## GETTING A CELLULAR SIGNAL INSIDE WITH CEL-FI QUATRA 4000

"When we were about two-thirds through with installing the public safety system, it was clear that the cellular coverage gaps needed to be fixed right away. When the walls went up, they lost virtually all of their signal indoors," says Morales. "They had a lot of glass and metal in the new construction, as well as robotics, moving parts and other physical barriers that blocked signal and prevented good RF propagation. So we began installing Cel-Fi QUATRA 4000 while completing the public safety system installation."

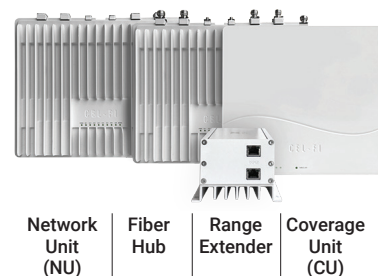
Cel-Fi QUATRA 4000 active DAS hybrid specifically addresses the challenges of poor voice quality, dropped calls, and dead zones in large commercial buildings. Unlike analog boosters and bi-directional amplifier (BDA) passive systems, QUATRA delivers a cellular signal that is up to 1000x stronger for all major carriers simultaneously, offering a much larger coverage footprint. It is fully digital and uses lossless Ethernet cabling, making the installation easier and faster. Power over Ethernet eliminates the need to install additional power outlets for the Coverage Units (aka Remote Units).

Issues frequently arise when public safety and commercial cellular amplification solutions are installed in the same facility due to interference between the signals of the systems. This problem usually needs to be resolved by placing large cavity filters between the head-end of the two systems and the remote units. These filters cost between \$1,000 to \$2,000 and many would be needed in facilities as large as these.

However, when Cel-Fi QUATRA RED and Cel-Fi QUATRA 4000 are installed in the same facilities to address both public safety and commercial cellular coverage, this problem is avoided. Cel-Fi products are guaranteed unconditionally network safe, with no interference on the macro or other networks.

Cel-Fi QUATRA has a Network Unit (NU) that is the head-end of the system, and Coverage Units (CUs) that are the remote RF units to connect external antennas and distribute the cellular signal throughout the buildings. Powernet installed three NUs and 15 CUs in the 600,000 square foot building, and one NU and five CUs in the 200,000 square foot building.

Two donor antennas for the cellular carriers were installed on the roof of each building. One donor antenna on each building was dedicated to Verizon, with the remaining three major carriers consolidated on the other antenna. In compliance with IFC and NFPA codes, separate donor antennas were installed for the Cel-Fi QUATRA and Cel-Fi QUATRA RED systems. The cabling was wired separately for each system as well.



## THE RESULTS

"The deployment of the systems went great," says Morales. "It took a four-person team about three weeks on and off to do the installation of both systems. Once the cabling was done, installing and commissioning QUATRA took two days as the systems are self-configuring. Optimum antenna positioning was also fast and easy using Cel-Fi WAVE."

Cel-Fi QUATRA RED passed the inspection needed for the Certificate of Occupancy on the initial AHJ inspection test, which was largely why QUATRA RED was chosen for this time sensitive project.

Cel-Fi QUATRA 4000 delivered strong cellular reception throughout the facilities, providing 99% coverage where previously there was only 5% of the building with usable signal, according to Morales. When asked for feedback on the system, executives from the manufacturing facility said, "Don't turn them off!"

### CEL-FI QUATRA



Enterprise System

### CEL-FI QUATRA RED



Public Safety System

## BEYOND BETTER COVERAGE

- Cel-Fi QUATRA RED an all-in-one, ERRCS solution for both LMR and FirstNet housed in the same facilities with industry leading in-building cellular coverage systems
- Cel-Fi QUATRA RED built for building owners to get a faster Certificate of Occupancy and optimum public safety signal reception
- Cel-Fi QUATRA RED and Cel-Fi QUATRA are built for integrators for faster, simpler installation, easier maintenance, and confidence in systems that deliver what customers want customers want