

TEST AND IMPROVE CELLULAR NETWORK COVERAGE FOR MISSION CRITICAL COMMUNICATIONS



RAIL

Optimize Efficiency and Reduce Costs

Traditional private networks require costly resources to build, operate and maintain. With cellular networks becoming more reliable and ubiquitous regarding coverage, as well as less costly, industries that once relied on low bandwidth non-LTE private networks are now migrating over to commercial cellular networks for mission critical communications with a communications service provider (CSP) or to private LTE networks.

Railroads are advanced transportation systems that require sophisticated communication networks with numerous capabilities. These include not only positive train control (PTC), but also railcar location tracking and monitoring of critical components and events such as high impacts, intrusions, hazardous materials, refrigeration temperatures and fuel.

Railroads are migrating to cellular networks. To ensure reliable and safe rail operations, knowing which cellular signals are available and employing advanced antenna technology to

connect with distant cell towers is essential. Furthermore, determining whether a site has cellular coverage can eliminate the need for costly satellite connectivity.

Rail and other industrial users require additional capacity to keep pace with the need for enhanced broadband connectivity. Private LTE is a cellular-based network that is capable of reaching a wider area to provide secure, reliable and flexible wireless connectivity for mission critical communications. It allows expanded data capacity, increased speeds and greater security.

The 900 MHz band (896-901/935-940 MHz) was recently realigned by the FCC to create three MHz paired channels (uplink/downlink) in the 897.5-900.5/936.5-939.5 MHz portion that are compliant with the 3rd Generation Partnership Project (3GPP) FD-LTE. This new band plan does not interfere with the current narrowband licensees within the 900 MHz band, as some customers will continue to rely on narrowband deployments. In addition, the CBRS (3.55-3.7 GHz) band provides additional licensed and unlicensed spectrum available for private LTE.

Enable Business Connectivity and Transform Operations

PCTEL® has two complementary portfolios that can help rail organizations maximize wireless connectivity: test & measurement solutions and wireless antenna solutions. With accurate test data, you can locate base stations and analyze operator coverage. Our experts can help you select the best antenna configuration and placement to optimize connectivity for your fixed sites.

Wireless Antenna Solutions

4G LTE (and stand-alone 5G NR in the near future) can meet the requirements for robust mission critical communications. LTE wireless cellular routers enable connectivity to the monitoring points and actionable devices. For enhanced reliability, a cellular router with dual mobile operator connectivity can be employed in the event that a network without a private backup goes down. To maximize signal strength, advanced directional antennas aimed at the cell towers or highly efficient omnidirectional antennas enhance connectivity and network availability.

Test & Measurement Solutions

CSP subscribers and private LTE network users must verify coverage in the proximity of the remote cellular routers to determine which signals are strongest. LTE signals can be carried over private LTE networks or by more than a dozen bands with numerous CSP channels. Consequently, a cellular scanning receiver that decodes cellular signals on every channel (as well as narrowband P25, DMR and TETRA signals as needed) is an ideal solution for planning and deploying cellular routers on location. Omnidirectional antennas identify the strongest CSP channel on each band at a specific location and can also identify the cellular operator via Layer 3 messaging.

Whether using a private LTE or a CSP network, the antenna must be properly aimed at the cell tower to obtain maximum signal strength and reliability. A scanning receiver enables the user to find the optimum mounting angle to permanently connect the antenna to the cellular router. This is a typical outdoor application for PCTEL scanners.



High Performance 5G Ready Antenna Options for Cellular Networks

	Antenna Model	Description	Frequency Ranges
	PLTE7027M	Multiband coverage panel antenna with high gain, and a rugged housing design with a heavy-duty mounting bracket, for mast or wall mount installations. It is ideal for outdoor DAS.	698 - 960 MHz / 1710 - 2700 MHz
	BOA-LCMGPS-PTNM	Durable and easy-to-install multiband antenna with broadband element technology to achieve superior bandwidth performance for mobile data and video communications.	690 - 2700 MHz
	GLHPDLTE-LTB GLHPDLTE-LTW GLHPDLTEMIMO-LTB GLHPDLTEMIMO-LTW GLHPDM3-LTB GLHPDM3-LTW	Engineered to support the high-speed requirements of complex RF communication systems, used for Intelligent Transportation Systems (ITS), Industrial IoT applications and mission critical communications. This antenna platform offers a compact footprint, proprietary high-rejection multi-GNSS technology, and two 5G elements compatible with the frequencies of the world's leading cellular routers.	600 MHz - 6 GHz 2.4 - 2.5 GHz 4.9 - 5.9 GHz 1565 - 1608 MHz
	GL9X1AX-SF GL7X1AX-SF GL6X1AX-SF GL4X4-SF-PLK	Combination antenna platform that incorporates WiFi MIMO, four dual band WiFi elements, and proprietary high-rejection multi-GNSS technology.	600 MHz - 6 GHz 2.4 - 2.5 GHz 4.9 - 5.9 GHz 1565 - 1608 MHz

Scanning Receiver Packages, Options and Accessories for Cellular, LMR and WiFi Coverage Testing



Kits	IBflex® Scanning Receiver	SeeHawk® Touch Software	Accessories
	Lightweight multiband, multi-technology precision radio receiver with Bluetooth® connectivity	Data collection, spectrum analysis reporting tools on an Android™ tablet	
Rail (09503-01) (includes SeeHawk® Touch Software and Accessories)	<ul style="list-style-type: none"> Decode all 4G LTE North American cellular bands 10 MHz to 6 GHz and the CBRS/900 MHz band LTE Layer 3 Spectrum Analysis 	<ul style="list-style-type: none"> Outdoor Mode Signal Analyzer Collect Reporting 	<ul style="list-style-type: none"> Android™ tablet Battery pack Back or side pack Walk test antennas Carrying case A/C charger
DMR, P25, or TETRA add-on option	<ul style="list-style-type: none"> P25 (09500-09-U1) DMR (09500-12-U1) TETRA (09500-15-U1) 	<ul style="list-style-type: none"> RSSI, SINR and BER measurements 	
WiFi add-on option	<ul style="list-style-type: none"> 2.4 and 5 GHz WiFi bands WiFi Technology (OP524-Wi-Fi) WiFi Adapter (OP614-WD) 	<ul style="list-style-type: none"> WiFi RSSI 	
Additional options	<ul style="list-style-type: none"> 5G NR Technology (OP524-NR) LTE-MIMO (OP635) 		SeeWave® Host Platform (OP411-A) requires one or more of the antennas below: <ul style="list-style-type: none"> 617 MHz - 6 GHz Log Periodic Antenna (OP436) 220 MHz Yagi Antenna (TBD) 450 MHz Yagi Antenna (OP410) Other Accessories <ul style="list-style-type: none"> SeeWave® Interference Location SW (09301-A) Additional battery(s) (OP429)

PCTEL test & measurement and wireless antenna solutions optimize connectivity to gain efficiency, safety and security. Even if you have already selected a carrier, optimal antenna selection and placement can dramatically improve coverage and reliability at remote sites. Combining both solutions provides the best results for long-term operational success.

Learn about our complete portfolio of test & measurement and purpose-built antenna solutions for leading carrier networks.

> pctel.com/products

Solving Complex Wireless Challenges

PCTEL, an Amphenol company, is a leading global provider of wireless technology solutions, including purpose-built Industrial IoT devices, antenna systems, and test and measurement products. Trusted by our customers for decades, we solve complex wireless challenges to help organizations stay connected, transform, and grow.



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