

ENSURING RELIABLE, IN-TUNNEL WIRELESS CONNECTIVITY

BACKGROUND

Tunnels play a crucial role in modern transportation and commerce, enabling goods and passengers to reach their end destination faster, safer, and more comfortably than via conventional over-ground transportation.

In tunnel environments, wireless connectivity for the public and government is essential. Robust cellular coverage must be available to passengers, regardless of their network operator or service. For entertainment and content delivery, a fundamental part of the driving experience, FM and DAB (digital audio broadcasting) broadcast services are a necessity. For public safety services, for things like accidents, vehicle break downs, fire, or other emergencies, FM/DAB break-in provision are becoming essential to ensuring a safe in-tunnel experience for both drivers and passengers alike. In Europe, break-in functionality is already mandatory for tunnels longer than 500 m.

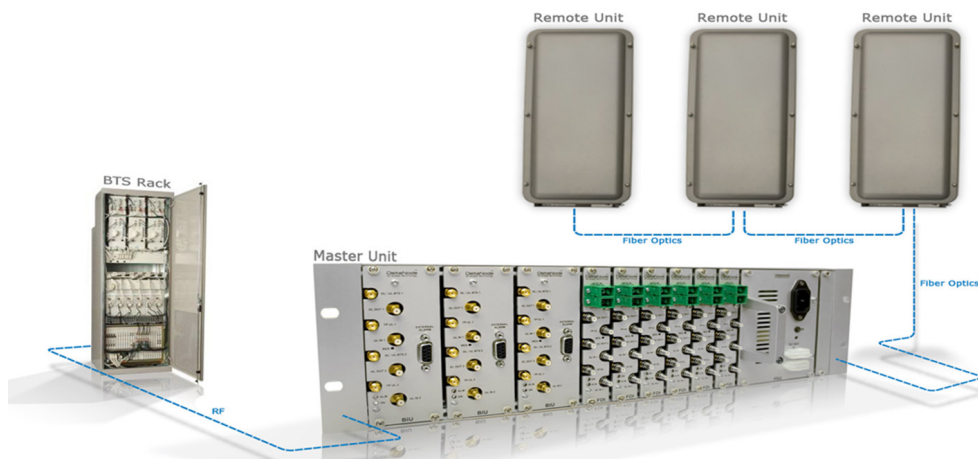
Meeting these requirements while ensuring seamless in-tunnel wireless connectivity requires a proven solution with no surprises that enables all different technologies, bands,

and services to be delivered, with excellent performance, from a single unit.

SOLUTION

Bird offers an active Distributed Antenna System (DAS) that delivers all different technologies, bands, and services over a single strand of fiber, with superior uplink and downlink network performance. Excellent optical and radio performance enables the system to handle up to 15-dBo optical loss, with a best-in-industry noise figure of 3 dB, providing enormous flexibility in terms of fiber design.

The system allows for limitless combinations of band and power configurations. Cellular, FM, DAB, and public safety services are delivered from a single unit, while various amplifier types can be mixed in a single remote housing, taking advantage of the varying propagation properties different bands present. This reduces capital expenditure investment and the equipment footprint, which is a crucial factor in tunnel environments.



CONNECTIVITY CHALLENGES

In tunnel environments, drivers and passengers expect cellular, FM, and DAB services anywhere, anytime. Likewise, blue-light services such as VHF, Tetra, and PMR systems, among others, are becoming standard for emergency situations. Providing the wireless connectivity for such services is a daunting task due to the topology and materials used for tunnel construction. But those aren't the only reasons.

Other challenges stem from requirements like redundancy and support for break-in functionality, which are absolutely essential to ensuring in-tunnel safety and to allowing fire, police, and local authorities to coordinate and intervene as needed. When an emergency occurs, for example, authorities may want to interrupt FM/DAB transmissions with an informational message. However, due to diverse tunnel topologies (e.g., single- or dual-tube architectures) and a multilingual population, different messages would need to be delivered.

The Bird DAS offers the following key features for tunnel environments:

- FM/DAB and break-in functionality

For FM and DAB services over long tunnels, Bird's active DAS can distribute both DAB and FM signals over multiple DAS remote units. In shorter tunnels, Bird's advanced technology off-air channelized repeaters offer DAB enhancement where there is no base station availability. The DAS can also be equipped with break-in modules, which allow live or recorded emergency messages to be distributed along the tunnel to drivers and passengers.

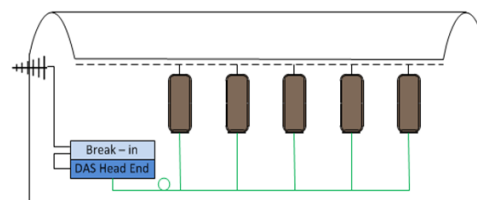
- System monitoring

The DAS can be controlled, operated, and maintained from virtually anywhere in the world by authorized system operators. No special software is required. Instead, system operators can use any standard web browser to quickly and easily configure and manage the system. Designated operators are notified of any abnormal system conditions via SNMP traps sent to upper-level management systems.

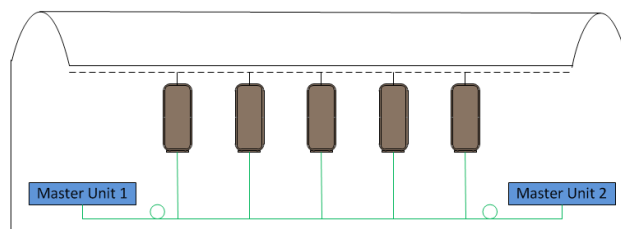
- Redundancy

The Bird DAS supports several levels of redundancy, both for head-end and remote unit modules. A typical public safety configuration comprises remote units fed from two geographically separated master units to ensure that coverage is provided if the primary unit goes down. This guarantees connectivity and allows public safety systems to remain fully operative, even if the tunnel is partially destroyed.

With its array of features, the Bird DAS provides the ideal solution for ensuring reliable, seamless, in-tunnel wireless connectivity. Find out more about the Bird DAS at www.birdrf.com.



DAS system



Bird is an industry leading provider of RF communications products, services, calibration, and training to the Public Safety, Cellular Communications, Distributed Antenna Systems (DAS), Broadcast, Semiconductor, Military, Government and Medical markets. For 75 years, Bird continues to provide the RF communications industry with reliable field and infrastructure products including Analyzers, Antennas, Combining Systems, Components, Duplexers and Triplexers, Filters, Loads and Attenuators, Power Sensors and Meters, Power Monitors, Signal Boosters, Cellular Repeaters, Fiber DAS, Tower Top Amplifiers and Receiver Multicouplers, RF Streaming Solutions, RF Signal Generation, and Software Analysis Tools. Learn more at www.birdrf.com.

