



Best Practices for Wireless Radiant Coax Deployments

Radiating cable (leaky feeder, leaky coax) systems provide reliable wireless coverage in challenging environments like tunnels, railways, and industrial facilities. Best practices focus on optimizing signal integrity, minimizing interference, and ensuring robust installation.

Pre-Deployment and Design Strategies

- Test different leaky cable vendors in a lab and determine electric tilt angle and lateral radiating angle.
- Consider the proper design strategy relative to roaming: the RF cable can run along the corridor (more cost, less roaming), or it can run across it (less cable, more active roaming).
- Determine the frequency strategy for dual-feeding (e.g. 2.4 + 5 GHz, or 2.4 + LTE...), compromise on cable capabilities.
- If high performance is needed, explore enabling MIMO in a single cable for cost effectiveness (like Smart-MIMO).
- Consider electric tilt when designing: the signal will reach the ground several meters forward from each radiating slot, depending on the tilt angle.

Installation and Placement

- Maintain 4" (100 mm) clearance from metallic objects and 2" (50 mm) from concrete walls to prevent signal degradation.
- Maintain a minimum bending radius per cabling manufacturing specification.
- Secure cables with plastic hangers/clamps ≤ 1 m apart, avoiding metal fasteners or as per cabling manufacturers specification.
- Consider running a dielectric rope along the installation path and tighten it before fastening the coax cable on it. Aramid or similar material will not loosen over time.
- In tunnels, mount cables ≥ 1 m from walls and ensure 1m overlaps between segments.
- Take your time and use appropriate tools and hardware to cut and terminate with care.
- Clean all dielectric shavings out of the tube.
- Use a file on the end of the center core to clean rough edges after cutting to ensure solid contact with the termination hardware.
- Space parallel radiating cables ≥ 12 " (30 cm) apart to reduce crosstalk.
- Configure each access point to operate on distinct wireless channels or frequencies. Avoid single-channel architecture, as they are not recommended.



- Position cables at train window height for optimal RF penetration into carriages, adjusting for track bed and vehicle specifications.
- Ensure all runs are below the recommended maximum distance. Often it is best to shoot for a run at least 10% below the maximum distance.
- Use high quality connectors, splitters and terminations.

Physical Cabling Maintenance

- After installation, inspect the alignment of the cable every two weeks until the cable relaxes.
- Use torque striping to help visually confirm cable remains in alignment over time.
- Rubber strap type pipe wrenches can help quickly adjust twists in cables.
- Monitor all active components (amplifiers, splitters and duplexers) for performance and faults (SNMP or similar protocols)

Signal Management & Interference Mitigation

- For Wi-Fi (2.4/5 GHz), keep client antennas 4-20 cm from the cable, aligning them with the cable's radiation slot.
- Utilize fixed attenuators on client side to help match client power output to AP.
- Avoid proximity to high-voltage lines to prevent broadband noise. EM fields generated by high voltage lines create substantial Electromagnetic Interference (EMI).
- Avoid placing antennas near GPS antennas or other high-powered electronics that could cause interference.
- Assign non-overlapping Wi-Fi channels to adjacent systems.
- Environmental considerations should be made regarding air quality and can influence effective distance of transmissions.
- Consult manufacturers documentation for specific guidelines surrounding potential interference and mitigation.
- Conduct wireless assessments before system planning to identify existing wireless systems and potential interferers that must be accommodated.
- Higher frequencies (e.g., 5 GHz) exhibit greater attenuation (6.4 dB/100m at 1900 MHz), requiring more frequent signal amplification.
- For ultra-broadband applications (up to 4.2 GHz), use mode-suppression cables to eliminate stopbands.
- If dual feeding the cable, utilize channel separations such as UNII-1 and UNII-3 and ensure use of fixed attenuators on each end.

AGV-Specific Integration



- Pair radiating cables with fast roaming radios (<40 ms handoff) to prevent I/O faults during AGV movement between cable segments.
- Limit wireless roaming channels and frequencies on the client radio to those exclusively used by the wireless access points.
- Optimize client radio wireless roaming thresholds to enhance the roaming process and minimize weak connections.
- Position the antenna within 10 to 20 cm of the radiating cable's radiation slots to maximize coupling efficiency and minimize signal loss.
- Ensure a clear line of sight between the antenna and the radiating cable to avoid physical signal obstructions.
- Route antenna cables away from power cables or other RF sources to reduce electromagnetic interference within the AVG itself.
- Mount antennas to align with the polarization of the radiating cable and the transmitted signal.

Performance Monitoring

- During persistent communication disruptions, test for VSWR (Voltage Standing Wave Ratio) to identify cable damage or connector issues.
- Use RF mapping tools to validate coverage during commissioning and periodically throughout the system's lifespan, especially in curved rail sections or near structural obstructions.

Safety Considerations

- Installing cables too close to high voltage sources can induce current into the cable and damage equipment and pose an electrocution risk.

These guidelines balance RF performance with practical installation constraints, adapting to specific environmental challenges while maintaining signal reliability for moving receivers like trains or AGVs.