Microlab
A Division of RF Industries
300 Interpace Parkway
Parsippany, NJ 07054

How the Microlab SMART Passives System Works

A public safety, emergency responder radio communications system (ERRCS) DAS must consistently deliver reliable performance to provide high-quality communications and radio coverage to first responders amid an emergency. Due to their tactical nature, emergency communications systems must satisfy rigid RF signal coverage (RSSI) and delivered audio quality (DAQ) requirements, such as maintaining 99% radio coverage in mission-critical areas of a building and greater than 90% radio coverage across all floors in general areas. However, it can be a year or more between proof-of-performance, floor-by-floor, walk-through grid tests, which are used to validate the operation of these critical communications systems. The Microlab SMART Passives System eliminates the uncertainty surrounding the overall integrity of a public safety DAS and radio performance with real-time monitoring of DAS cabling, RF components, and antennas deep into a building (Figure 1). Comprised of a SMART Gateway at the head-end and a network of SMART Couplers, the SMART Passives System and its real-time diagnostics capabilities will ensure the integrity of critical DAS infrastructure by continuously monitoring for catastrophic failures (open or short circuits) or properly terminated antennas and cables.

Figure 1: The Microlab SMART Passives System, featuring the SMART Gateway and a pair of SMART Couplers.

The SMART Gateway is installed at a DAS head-end's main RF source, such as a bidirectional amplifier (BDA) or a building's dedicated repeater. The uniquely designed SMART Gateway is a hybrid passive and active diagnostic unit that generates a calibrated, continuous wave (CW) tone in the industrial, scientific, and medical (ISM) band. The CW carrier tone is used by each SMART Coupler at its coupled and through port to measure the voltage standing wave ratio (VSWR), which is time- and date-stamped. The Microlab SMART Coupler utilizes a broadband, passive coupler enclosed with an active, Industrial Internet of Things (IIoT) circuit board, and is designed to replace common passive DAS tappers or couplers required in passive DAS designs.

The reference VSWR measured at each SMART Coupler's port is consistently observed and compared, with any anomalous readings triggering an alarm that a catastrophic failure or degradation has occurred, i.e. the open or short circuit conditions. Various events can lead to DAS failure over the course of a year between proof-of-performance tests. For example, building maintenance and enhancements, including plumbing, electrical, lighting, HVAC repair, security systems, and computer network cabling, might cause disconnections or damage to DAS antennas and/or coaxial cabling. These matters will compromise DAS integrity and impede proper radio performance for first responders.

If the SMART Passives System detects a failure, the SMART Gateway will send an alarm through SNMP traps by either email or SMS, which may be routed to monitoring centers, authorities having jurisdiction (AHJ), building owners, or system integrators responsible. The alarm notification will be based off the MAC address of the detecting SMART Coupler, meaning the notification will contain the malfunction's approximate location (MAC addresses should be recorded on as-built and/or iBwave design drawings to expedite troubleshooting). The SMART Gateway's normally closed, dry contact, general alarm terminal may also connect to a fire alarm panel for additional alert purposes. By connecting a computer browser to the SMART Gateway, users can conveniently view all diagnostics – alarms, forward and reflected RF power (VSWR), RSSI RF power from the SMART Gateway's calibrated signal, and overall DAS performance – through a multi-layered graphical user interface (GUI).

As shown in Figure 2 below, a catastrophic failure in DAS cabling has occurred on the second floor of a building. Since the building has integrated the SMART Passives System solution, the failure was detected by the second floor SMART Coupler denoted as SC-02, which captured the abnormal VSWR measurement, indicating a short or open circuit feeding Antenna 2. The SMART Gateway promptly received the alarm status from the SC-02 SMART Coupler, and immediately sent the malfunction notification into the cloud through SNMP via TCP/IP network connections. In the end, the SMART Passives System enables faster troubleshooting and reduces the time needed to restore a public safety DAS network.

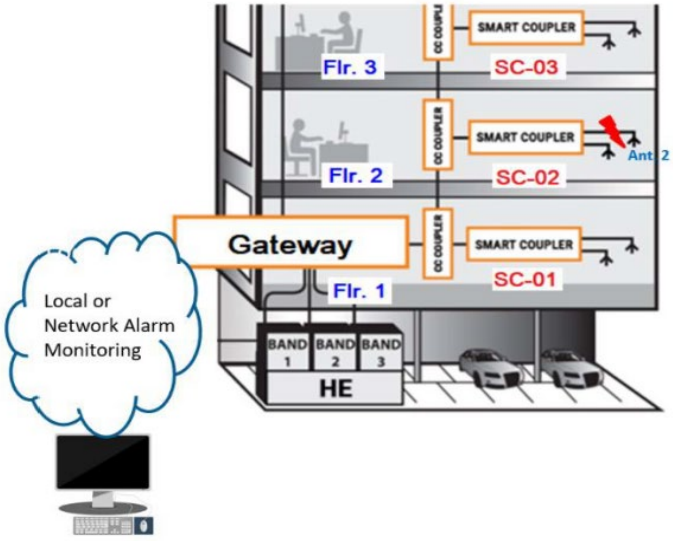

Figure 2: An example scenario demonstrating the SMART Passives System's response to a catastrophic loss of radio coverage on the 2nd floor of a building.

The head-end's SMART Gateway supplies DC power, provides diagnostics, and communicates with up to 30 SMART Coupler nodes through the DAS RF coaxial cabling. This means SMART Coupler implementation does not require local network connectivity or DC power connections.

First responders rely upon public safety networks for critical communications during unpredictable crisis situations, leaving no room for a lapse in network performance. The Microlab SMART Passives System, comprised of the SMART Gateway and a network of SMART Couplers, delivers real-time, continuous monitoring of critical DAS infrastructure to ensure the readiness of life-safety communications. To read more about the various public safety DAS solutions Microlab can deliver, visit https://microlabtech.com/lmr-public-safety.