

Spotwave Backgrounder

The Adaptive Difference – Intelligent Technology

While cell phones have become ubiquitous and advanced new wireless services are increasingly popular, access to the macro wireless network is frequently blocked inside homes and small workspaces. This prevents calls from being completed and lowers the throughput of wireless data services. To address coverage problems experienced by wireless subscribers at home, Spotwave has created ZEN, the first intelligent indoor wireless coverage system for the consumer market.

ZEN is an intelligent wireless coverage system based on patented adaptive technology from Spotwave commercial products. ZEN improves indoor signal strength of cell phones, PDAs and 3G enabled devices across the entire PCS band (1900 MHz), and is the only intelligent adaptive coverage solution designed for homes and small workspaces up to 2500 sq ft.

What is Adaptive Technology?

Spotwave's products incorporate smart antenna technology and adaptive techniques to improve wireless signal strength indoors. They operate by continuously scanning and monitoring the radio frequency (RF) signaling environment, and dynamically changing their power and gain when necessary.

These changes are controlled in real-time by an advanced adaptive algorithm, which allows the coverage area to remain constant while preventing any potential for oscillation or interference. As a result of this intelligence, Spotwave products protect the integrity of the carrier's network while also delivering clear voice quality with maximum data throughput when using wireless devices indoors.

Traditional BDA and Repeater Operation

Traditional bi-directional amplifiers (BDA) and repeater-based systems work by gathering signals from outside the building and amplifying them inside; similarly, signals from inside the building are amplified outside the building. BDA-based solutions require additional antennas and specialized cables. These solutions must be designed, engineered and monitored to ensure that they have no impact on the macro network. Their installation requires specialized tools (like spectrum analyzers) and prior knowledge of the network.

- BDA-based systems are static solutions operating in a dynamic environment.
- There is a high risk of oscillation, especially when the systems are installed by subscribers. Installation is complex, and manual intervention is needed when the network or building environment changes.
- Spectrum integrity is compromised because the systems can generate spurious signals.

Interference Problems

The risk of interference that can be created by traditional BDAs or repeaters may not be readily understood by the consumer buying these products. FCC approvals alone do not guarantee that a product will not interfere with a carrier's network. These types of products are static, yet operate in a dynamic, changing wireless environment. This is likely to result in oscillation when the network experiences changes since the repeater cannot sense the changes and adjust its gain and power levels.

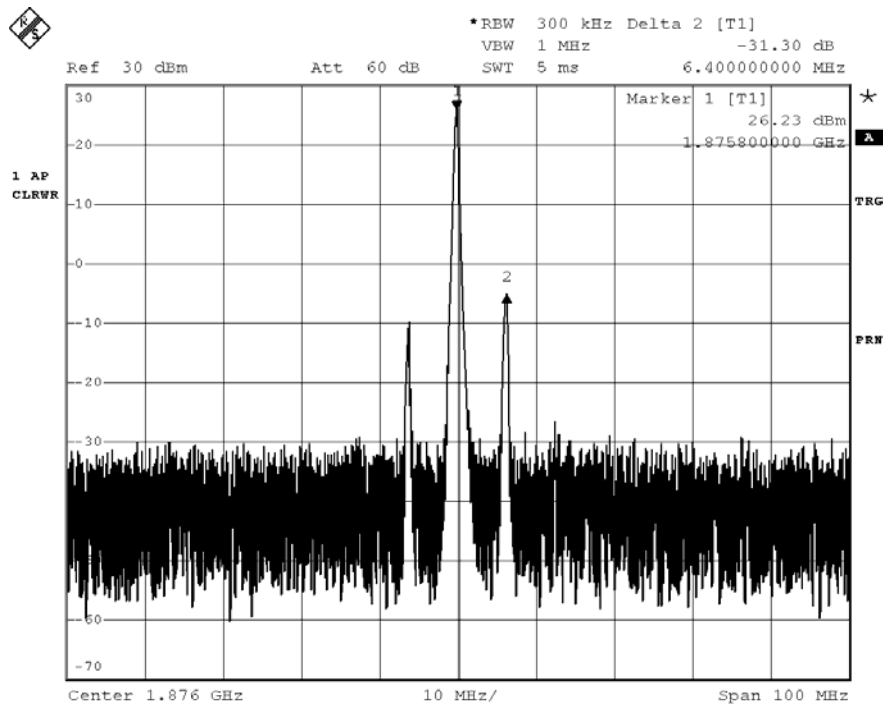
Several factors can create a change in the wireless network. Things as common as tree foliage changes from summer to winter, or construction of a new cell site in the area can result in wireless environment changes. When one of these products goes into oscillation, it can create problems with the carrier's closest base station or cell site and can stop functioning completely. This type of interference degrades wireless network performance and capacity, negating the benefits the product was put in place to achieve. If you consider multiple instances of this type of product turned on within a carrier's network, the consequences of this oscillation have a much larger impact.

Spotwave's products however preserve the network performance and can also restore it in situations where poor in-building coverage may have reduced network capacity.

The figure below is an example of the oscillation that can occur with a traditional repeater.

The product tested began to oscillate (note the peaks) with just 2dB of gain change.

- System installed at +26C no alarms
- Oscillation starts at +10C (2 dB repeater gain change)



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Spotwave's products dynamically adjust for wireless environment changes to maintain a consistent coverage area footprint and stability for the network.

The table below outlines how Spotwave's intelligent technology adapts to wireless changes.

Environment Change	Intelligent response	Impact
Received power decreases	Increase gain	Maintain coverage area
Received power increases	Decrease gain	Maintain coverage area
Isolation decreases	Decrease gain	Prevent oscillation, adjust coverage area
Isolation increases	Increase gain	Increase coverage area