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CleanSignal™ - Technology Overview

Patented - Tunable Carbon Composite RF Shielding Technology

CleanSignal™ Technology as applied to Antennas

The communications industry continues a rapid shift towards digital wireless access infrastructure such as licensed microwave, licensed/unlicensed point-to-point and multipoint broadband systems. These systems support a plethora of vendor provided broadband, wideband, baseband and narrowband hardware systems that are located in space, on towers and in/on buildings where they service an ever changing and increasing number of end-user devices. Common to all these ecosystems are radio frequency (RF) communication and associated hardware systems with internal and/or external antennas and cables.

CleanSignal™ collectively defines the methods, processes, materials, formulations, and patterns of structured composite materials used to substantially reduce RF interference on communications systems.

Every device in a modern communications network - from laptops and smart phones to radio towers and global satellite positioning systems - requires an antenna(s) in order to transmit and receive information. Antennas take various forms and can function in a variety of ways; but irrespective of their form or function, it is the quality and configuration of the antenna that makes the difference between a strong, coherent signal and a signal weakened by unwanted interference.

Conventional approaches to mitigate background noise and interference, to improve antenna performance, typically center on increasing the gain. But increasing signal strength often increases noise, and also increases the need for more input power. Other approaches include using frequency hopping protocols or specialized electronics to filter out the noise; yet others target the shape, construction and/or the materials of the antenna itself to help focus or reflect the signal more effectively.

But the fact remains that businesses, governments, and agencies worldwide are still plagued by dropped calls, limited bandwidth, faulty transmissions, and corrupted signals. This unreliability, paired with the additional power consumption

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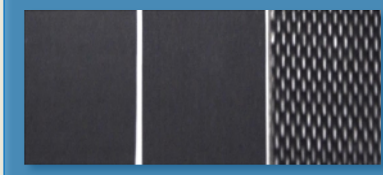
CleanSignal™ can be applied to existing antennas as a retrofit solution and also as a key component to new antenna design and manufacturing.

CleanSignal™ represents the first of a family of patents using structured carbon composites. CleanSignal™ provides a transformative step toward improving the functionality, reliability, durability and performance of antenna systems.

The CleanSignal™ composite is tunable for Broadband, Baseband and Wideband



mentioned above, has presented an opportunity for an entirely new solution: One that reduces background noise and interference and increases signal reception sensitivity, without the need for more power.

TangiTek CleanSignal™ technology has seized that opportunity to offer a revolutionary improvement in the performance of all antennas using tunable structured composites.

CleanSignal™ Antenna Technology: What It Is & What It Does

When it comes to antenna design the crucial questions that generally arise are: How can future antennas be made smaller, lighter, less expensive, more efficient, effective and sensitive?; How can wireless devices work better and be more reliable and improve the end user experience?

TangiTek CleanSignal™ uses novel composite structures to enhance the ground plane in antenna systems and electronic equipment. CleanSignal™ can dramatically increase the transmitted signal-to-noise ratio (SNR) by significantly reducing background noise caused by electromagnetic interference. In antennas, it is much like holding your hand behind your ear to help to block out the interfering sounds from behind, or cupping your hands by your mouth to cheer your favorite team. CleanSignal™ acts as a tunable filter, lowering background noise and preventing it from being introduced into the transmitted signal.

By diminishing the degrading effects of electromagnetic interference on signal quality, CleanSignal™ can increase the effective signal-to-noise ratio (SNR) by a minimum of 3 dB (in certain applications). This doubles the effective signal field strength and greatly increases reception range.

Most importantly, unlike conventional gain-boost approaches, CleanSignal™ improves antenna performance without using any additional power.

TangiTek CleanSignal™ can work with all existing antenna designs currently in manufacture: mobile

CleanSignal™ works with all existing antenna designs including satellite, microwave, land mobile radio, Wi-Fi, WiMAX, 3G, 4G LTE, GPS and Bluetooth antennas.

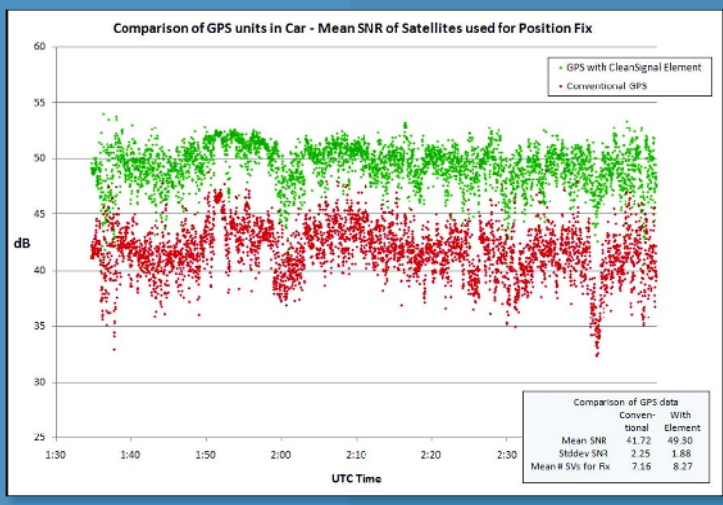
U.S. Patent # 8164527 CleanSignal™ - *"Antenna apparatus and method for reducing background noise and increasing reception sensitivity."*

TangiTek has four additional patents pending related to reducing or eliminating RF interference and noise that negatively impact wireless services.

Testing of CleanSignal™ enhanced GPS Units

Test No.	GPS Unit Tested	Test Configuration	Findings
1	Polstar/Parallax	Stock unit	Results consistent with product claims.
		Antenna & chipset enhanced w/ CleanSignal™	3 to 7 dB gain in SNR; more number of satellites used in GPS location fix.
2	Linx Module x/ ceramic patch antenna	Stock unit	Results consistent with product claims.
		Antenna & chipset enhanced w/ CleanSignal™	1 to 4 dB gain in SNR; more number of satellites used in GPS location fix.

phones, satellite communications, GPS systems, Wi-Fi, Bluetooth devices, etc. Since CleanSignal™ can make any antenna more efficient immediately, it offers a number of important benefits - smaller antennas, longer lasting batteries, fewer dropped calls, and increased communication range – all of which saves time, energy, and money. TangiTek CleanSignal™ technology doesn't simply improve antenna performance - it transforms the wireless communication system.



Testing and Application

One example of how CleanSignal™ transforms antenna performance is presented with testing on a Global Positioning System (GPS). GPS testing resulted in a minimum 3 dB boost in signal-to-noise ratio (SNR). This doubled the efficiency of the antenna with no additional power demand. Due to the reduced interference, marginally performing satellite signals now register while existing satellite signals have improved sensitivity and performance. Testing off-the-shelf GPS units enhanced with CleanSignal™, in real world driving conditions, showed an improvement of up to 7 dB in SNR.

Similarly, Wi-Fi testing with TangiTek CleanSignal™ increased effective range by 1.2 – 1.5 times, dramatically increasing access point coverage. The CleanSignal™ enhanced antenna improved both transmission and reception.

Evaluation of CleanSignal™ in several over the air tests consistently shows at least 3 dB boost in SNR in Wi-Fi applications – effectively increasing the signal range and reception quality.

How It Works

TangiTek CleanSignal™ is an engineered composite structure that functions as a tunable radio frequency filter. CleanSignal™ effectively shields the primary transmission equipment and antennas from noise/interference emitted from adjacent electronic devices and communications infrastructure.

As communications nanocells become more prevalent and as cell sizes get smaller, the need to shield signals from the adjacent sources becomes more crucial and challenging. This "*signal-to-noise challenge*" is especially problematic in interurban environments where a multitude of transmitters are in close proximity

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in densely populated office and apartment buildings. In addition, individual devices like tablets and mobile devices can contain multiple antennas. This high density of communications systems and infrastructure leads to interference and transient noise (cosite interference) that degrades communications. CleanSignal™ reduces RF interference more effectively than any other technology available today. CleanSignal™ helps "quiet" the increasingly noisy background to improve the integrity of transmitted microwave signals.

Green Technology: Doing More with Less

Green technology is all about doing more with less. CleanSignal™ can do its part by helping antenna systems use less power. Indeed, signal-to-noise ratio (SNR) and antenna performance directly correlates with effective use of power -- more usable signals can lead to the need for less power. Thus, communication devices antenna components and systems can be made smaller and lighter, and can be designed to require less power to operate, but performing at the same or improved efficiencies by incorporating CleanSignal™.

Low Cost, Easy to Adopt, Scalable

CleanSignal™ is easily adapted and implemented into any existing or future antenna and system designs. The CleanSignal composites are compact, lightweight, strong, thermally stable, and easy to manufacture and shape into any form. Manufacturing and materials costs are low, eliminating start up barriers to technology adoption. Typical costs are a fraction of a dollar for most Wi-Fi antenna applications. The CleanSignal™ composite thickness is 0.005 inch or less and can be designed to fit almost any form factor and engineered for any frequency.

Licensing and Partnership Agreements

TangiTek is currently entertaining partnership and licensee agreements. We require a NDA prior to engaging in detailed discussion. We invite you to visit www.tangitek.com to learn more about the technology.

Please call (503) 222-3837 to schedule an appointment to speak with one of our executive team.

CleanSignal™

Request an NDA so we can reveal why your products need our technology!