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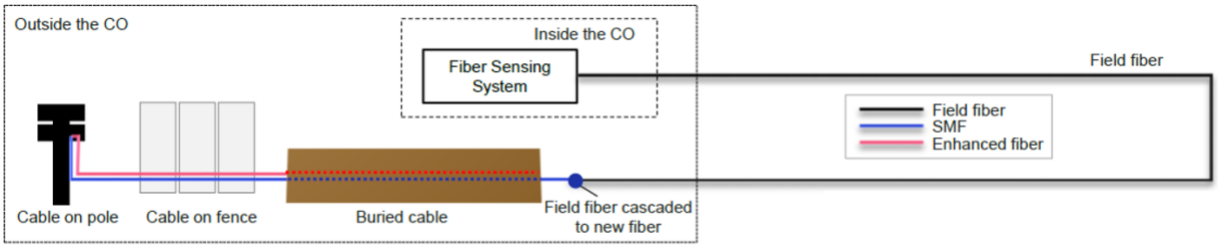
News Release

NEC and OFS Demonstrate Intrusion Detection using AcoustiSens® Enhanced Rayleigh Backscattering Enhanced Fiber in Telecom Cables as Sensing Backhaul

OFC Conference 2022, Booth 3939, San Diego, California, March 7, 2022 – NEC and OFS are pleased to report field test results of facility perimeter intrusion detection with distributed-vibration-sensing technology and AcoustiSens Rayleigh backscattering-enhanced-fiber with deployed telecom fiber cables as sensing backhaul. Various intrusive activities, including walking and jumping, are detected at greater than 100 feet (30.5 meters) from the perimeter of the cable. The use of AcoustiSens backscattering-enhanced fiber enables the use of existing telecom fiber to backhaul signals from remote sensing installations. The backscattering-enhanced AcoustiSens fiber is engineered to provide an order of magnitude increase in backscattering over telecom-grade fiber.

The field trial was conducted over a tier-1 carrier's metro central office (CO) network. The deployment was comprised of a distributed acoustic sensing (DAS) system located inside of the CO, connected to 38 kilometers (km) of standard metro field fiber, and three hybrid sections of telecom-grade single-mode (SMF)/AcoustiSens backscattering-enhanced fiber cable. To provide sensing comparison between telecom-grade and AcoustiSens fibers in numerous environments, three sensing zones of hybrid cable were buried underground (40–60-inch depth), attached to a fence, and lashed to a pole in the yard space surrounding the CO.



The DAS system measured acoustic events in the hybrid cable, simultaneously recording both the telecom-grade fiber and backscatter-enhanced fiber, to compare signal integrity at the distal end of 38 km of existing telecom cable.

To quantitatively investigate the sensing performance, sensing signals from SMF and the backscatter-enhanced fibers were collected. Signal-to-noise ratios (SNRs) were calculated in both fibers for several test cases. A person walked away from the cable starting at 6 feet out and continued to 108 feet from the cable. The backscatter-enhanced fiber observed the signals with averaged SNR of 5 dB (walking) and 20 dB (jumping), after the 38 km of field fiber, while the SMF failed to clearly resolve the activities. The walking signal of SMF was immersed in noise, making most of the steps indistinguishable. In contrast, the backscattering-enhanced fiber picked up almost every step with an increasing SNR from 1.2 dB to 18.4 dB. Every step from 6 feet to 108 feet (perpendicular distance to the cable) was identifiable using the AcoustiSens fiber.

Intrusion activities such as shaking the fence and climbing the pole were also compared. The enhanced fiber clearly distinguished the shaking signal and pinpointed its location while the SMF showed a weak pattern. These results highlight the restorative sensing performance improvements provided by the backscatter-enhanced fiber after a long distance of telecom cable.

“We showed, for the first time, that with the increased backscatter intensity from AcoustiSens fiber, interrogators can now remotely monitor facilities, backhauled through long metro distances, without significant degradation of signal integrity,” said Daniel Peterson, Director of Network Architecture at OFS. “This enables municipalities and clustered data-center zones to use a single interrogator to monitor multiple remote locations.”

“The ability to identify operational threats from a distance is key to the security of our nation’s critical infrastructure,” said Dr. Kathleen Kiernan, President of NEC National Security Systems (NSS). “NEC’s Intelligent Optical Fiber Sensing solution increases and improves the ability to monitor the millions of miles of ubiquitous, invisible fiber optic cable that transmits all manner of information that is essential to the well-being of our global community.”

NEC has 40-plus years of experience in transoceanic optical fiber communication and artificial intelligence technologies. The NEC Laboratories America research team applied this expertise to help create the Intelligent Optical Fiber Sensing (IOFS) solution. NEC’s IOFS solution offers telecom carrier/service providers a lower total cost of ownership for their existing infrastructures

by enabling efficient operation and management of their deployed fiber networks and providing new non-transport service offerings. NEC's AI-based IOFS solution protects their investment and opens opportunities to use their fiber for new revenue streams.

About OFS

OFS is a world-leading designer, manufacturer and provider of optical fiber, fiber optic cable, connectivity, fiber-to-the-subscriber (FTTx) and specialty fiber optic products. We put our development and manufacturing resources to work creating solutions for applications in such areas as telecommunications, medicine, industrial automation, sensing, aerospace, defense, and energy. We provide reliable, cost-effective fiber optic solutions that help our customers meet the needs of consumers and businesses today and into the future.

Headquartered in Norcross (near Atlanta) Georgia, U.S.A., OFS is a global provider with facilities in several countries worldwide. OFS is part of Furukawa Electric Company, a multi-billion-dollar leader in optical communications.

Please visit www.ofsoptics.com/.

About NEC

NEC Corporation is a $26.8 billion USD, global Fortune 500 technology leader with a presence in over 160 countries and regions and has more than 110,000 employees worldwide. One of the world's top patent-producing companies—holding more than 47,000 patents and operating six research laboratories on three continents— NEC invests more than $1 billion annually to research and development. NEC combines advanced technologies, services, knowledge, and its 122 years of operating expertise to help ensure safety, security, efficiency, and equality in modern society.

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