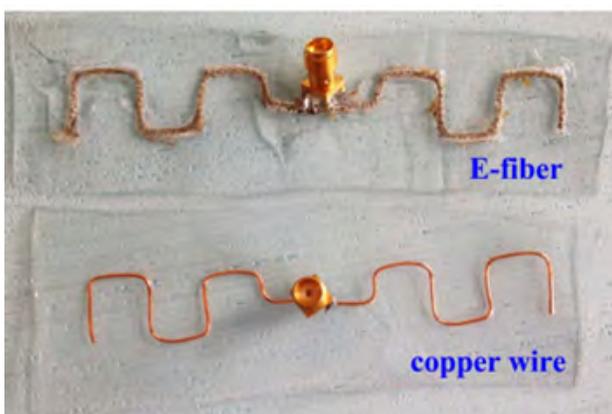


Stretchable and Flexible E-Fiber Wire Antennas

Current processes for manufacturing flexible, yet mechanically durable, antennas on E-fibers yield non-stretchable prototypes, and a lack of fine print details. Typically, their geometrical accuracy or resolution is no more than 1 mm. When applied to wire antennas with fine geometrical details, these processes for stretchable and flexible electronics are prone to failure due to fatigue and wear. They can also be complicated and difficult to reproduce. Aforementioned wire antennas are traditionally made of copper wires or by etching metal patterns on rigid substrates. When stretched or folded/twisted, these antennas are permanently deformed, or may even break. Thus, current products are not suitable for applications which require high flexibility and are subject to continuous mechanical deformation. The limitations of the current go-to product can be answered by this new technology. The invention fabricates stretchable and flexible wire antennas using E-fibers embedded in polymers. It has been tested to achieve reliable fabrication and excellent performance. The developed prototype exhibits comparable performance to their copper counterparts. Additionally, it also protects against corrosion and achieves higher geometrical accuracy of 0.3 mm.

INTELLECTUAL PROPERTY

Patent Pending



THE TECHNOLOGY

The Ohio State University researchers, led by Dr. John L. Volakis, developed a new process to fabricate stretchable and flexible wire antennas using conductive fibers (or E-fibers). The concept is to embroider the wire antenna using E-fibers and embed it into a stretchy polymer. The resulting wire antennas can withstand repetitive deformation. The developed E-fiber antenna can be stretched and flexed and still return to its original shape. It stands up well in other tests, as well as in comparison to its copper-wire counterpart. The development of this invention is in the late prototype stage. It has been tested in actual truck tires for the purposes of collecting automotive data and this showed comparable performance to that of their copper foil and copper wire counterparts.

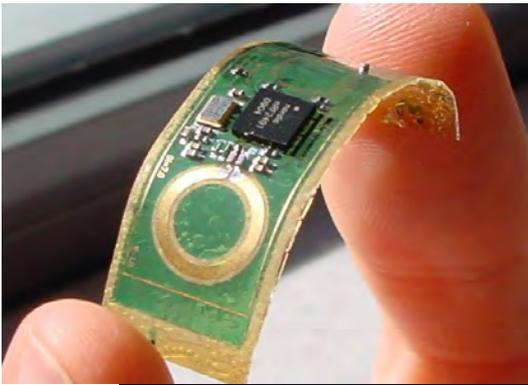
INVENTOR

John L. Volakis, PhD

Dr. Volakis started his undergraduate career from Youngstown State University, where he graduated with a BE degree in 1978. Later, he earned his MSc and PhD degrees from The Ohio State University in 1979 and 1982, respectively. After earning his PhD he worked with Rockwell International, Aircraft Division (now Boeing Phantom Works).

Outside of Ohio State, he was a professor in the Electrical Engineering and Computer Science Department at the University of Michigan from 1984 - 2003. Since 2003, he has been the Roy and Lois Chope Chair Professor of Engineering at Ohio State. He also serves as the Director of the ElectroScience Laboratory. In addition, Dr. Volakis teaches graduate courses in the electrical & computer engineering department.

His research interests include wireless communication and propagation, antennas and arrays, medical sensing, computational electromagnetics, and many more.



THE MARKET

The development of flexible and wearable electronics has been a major field of study for years. Until now, wearable technology products have been a fringe market of devices that have been impractical, bulky and unaesthetic for consumer applications. For many years, markets for wearable devices have primarily been focused on non-consumer applications, such as, healthcare, defense, and industrial. However, recent advances in many STEM fields have allowed wearable technology products to emerge.

MARKET OPPORTUNITIES

- **Electronics** Need for flexibility and wearability
 - Flexible display, battery, sensors, and memory
 - Smart clothing, watches, smart glasses
 - Printed or organic electronics

THE OHIO STATE UNIVERSITY

CDME is supporting the commercialization of technologies that emerge from Ohio State's annual research efforts. Ohio State has one of the largest research and development budgets of all universities. The amount of annual funding is a leading indicator of the breakthrough innovation occurring within the University. Recent annual highlights from OSU:

- » \$934 Million: Total research and development (R&D) expenditures
- » \$470 Million: Federal R&D expenditures
- » \$101 Million: Industry-sponsored research expenditures

Whether your interest is in licensing, sponsored research, joint ventures, investment, corporate giving or placement of our best students, Ohio State is here to help accelerate your business through innovation.

CONTACTS

CDME

1314 Kinnear Road, Columbus OH, 43212
cdme.osu.edu

Eric Wagner, Collaboration Manager
 wagner.293@osu.edu • 614-477-0303

Technology Commercialization Office

Jason "Jay" Dahlman Licensing Manager
 dahlman.3@osu.edu • 614-292-7945