

# Magnetic Fields for Wireless Communication

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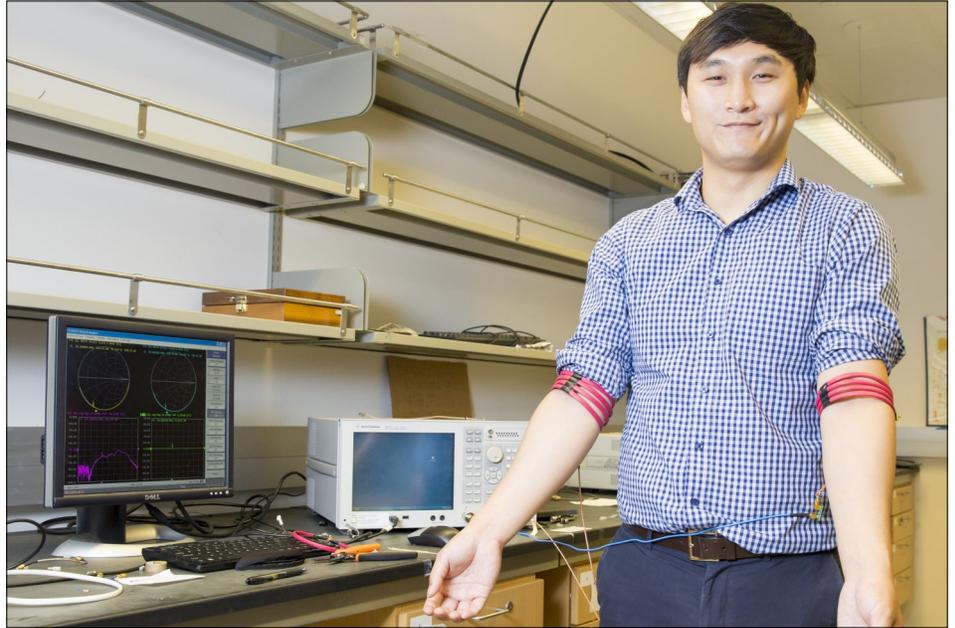
A new, lower power, more secure form of wireless communication may be on the horizon as researchers at the University of California San Diego develop the “magnetic field human body communication” concept. [1] This technique sends magnetic signals through the human body and could be used for full-body health monitoring. [1]

“In the future, people are going to be wearing more electronics, such as smart watches, fitness trackers and health monitors. All of these devices will need to communicate information with each other,” said Patrick Mercier, a professor in the Department of Electrical and Computer Engineering at UC San Diego who led the study. “Currently, these devices transmit information using Bluetooth radios, which use a lot of power to communicate. We’re trying to find new ways to communicate information around the human body that use much less power.” [1]

The ability to transmit health information to wearable devices in real time could be beneficial for soldiers in the field. In late August, the Department of Defense announced a partnership with a range of technology companies “including Apple, Boeing and Lockheed Martin—to develop electronics and wearables for the military. A major goal of the project is to create tools that can improve the health monitoring of troops in combat.” [2]

Bluetooth technology is nearly 20 years old and requires significant power to function. [3] In addition, Bluetooth and WiFi signals do not travel well through the human body, as the body tends to absorb the signal. [4] A magnetic field, however, travels easily through a body, and is more secure than Bluetooth and WiFi signals that extend significantly beyond the device. [4] Because this technique uses the human body as its communication medium and the signal does not radiate from the body, it is less prone to eavesdropping concerns. [1]

The magnetic field communication is still



**Jiwoong Park, an electrical engineering Ph.D. student and first author of the study, demonstrates communication from arm to arm using the magnetic field human body communication prototype developed in Mercier’s Energy-Efficient Microsystems Lab at UC San Diego. (Photo courtesy of Jacobs School of Engineering, UC San Diego)**

in proof-of-concept phase, but researchers have shown success in the magnet communication. [1] The researchers also have demonstrated that path losses in magnetic communication are up to 10 million times lower than losses associated with Bluetooth radio devices. [1]

Because the magnetic communication method is low power, it could also have a battery life benefit. “A problem with wearable devices like smart watches is that they have short operating times because they are limited to using small batteries,” said Jiwoong Park, a Ph.D. student in Mercier’s Energy-Efficient Microsystems Laboratory. “With this magnetic field human body communication system, we hope to significantly reduce power consumption as well as how frequently users need to recharge their devices.”

In addition, the magnetic communication is expected to be safe for the user as the magnetic signal will be significantly lower than wireless implant devices and MRI scanners. [1]

Advances in wearable technologies will continue to be important to future military missions. “[R]eal-time physiological data on muscle and brain injuries could help army doctors better triage those wounded in combat or even just spot soldiers that are dangerously stressed or exhausted.” [2]

## References:

- [1] Jacobs School of Engineering. (2015, August 31). [Magnetic fields provide a new way to communicate wirelessly](#). University of California San Diego.
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- [3] Nusca, Andrew. (2015, September 1). [Coming soon: Wearable tech that uses your body to transmit the signal](#). Fortune.
- [4] Savage, Neil. (2015, September 16). [Body Talk With Magnets](#). *IEEE Spectrum*.

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