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# Personal Telemetry Using Wireless Body Area Networks

## Note:

This awardee has received supplemental funding. This award detail page includes information about both the original award and supplemental awards.

## Award Information

**Awardee:** [The Regents of the University of California, Irvine](#)

**Award #:** 2016-R2-CX-0014

**Funding Category:** Continuation

**Location:** [Irvine, CA](#)

**Congressional District:** [45](#)

**Status:** Closed

**Funding First Awarded:** 2016

**Total funding (to date):** \$147,783

**Original Solicitation:**

[NIJ FY 16 Graduate Research Fellowship in Science, Technology, Engineering, and Mathematics](#)

## Description of original award (Fiscal Year 2016, \$47,783)

As submitted by the proposer: Safety of officers and on duty personnel has always been a major concern for security and criminal justice agencies. Accurate, real time remote

sensing of personnel body vital functions to detect their mental and physical state is a critical demand for ensuring their safety and preserving their performance efficiency. State of the art wireless solutions, such as Bluetooth, attempt to address such issues, however their relatively large size and power demands limited their widespread use for personal telemetry. This proposal advocates the use of a new communication channel instead of air, which is the human body itself. Our vision is to provide a network of smart mini-distributed body mounted sensors that can perform personal telemetry and connect to the external world wirelessly using a central hub. The sensors themselves will no longer require a radio frequency section or antennas since they directly interface to the skin (similar to smart watches) and hence will have a significantly reduced area, and use at least an order of magnitude less power, enabling a variety of network architectures and applications. The system will use very low power pulses for communication, well below what is required by health guidelines and exposure limitations. Distributing such small and smart sensors over the human body will allow users to monitor many vital signals, such as body temperature and electrocardiogram with unprecedented accuracy. The personal telemetry biofeedback provided by sensors can be used by the officers themselves to modulate their response, or monitored remotely at the command and control center to decide on appropriate actions. Over the first three quarters of the project, accurate modelling of the skin as a communication channel will be performed taking into account biological factors such as gender, age etc. as well as operational conditions such as heat, humidity etc. During the following year, we will design the system hierarchy and architectures, as well as circuit design, for having a multi-node smart sensor network. The following three quarters will focus on testing the system functionality in a lab setting, followed by testing under realistic conditions while taking all the variability and environmental conditions into account. Finally, feedback for system enhancement will be considered, and the dissertation and other scholarly publications will be published in the last two quarters. The proposed work has far reaching effects, not only in the area of public safety, but also for medical, general health care and fitness.

Note: This project contains a research and/or development component, as defined in applicable law.

ca/ncf

## Supplemental Award 1 (Fiscal Year 2017, \$50,000)

## Supplemental Award 2 (Fiscal Year 2018, \$50,000)

### Grant-Funded Publications

#### [Biometric Identity Based on Intra-Body Communication Channel Characteristics and Machine Learning](#)

**Journal:** Sensors

**Date Published:** 2020

#### [IBCFAP: Intra-Body Communications Five-Layers Arm Phantom Model](#)

**Journal:** IEEE Access

**Date Published:** 2019

#### [Physical Multi-Layer Phantoms for Intra-Body Communications](#)

**Journal:** IEEE Access

**Date Published:** 2018

**Date Created:** July 18, 2016

### Similar Awards

#### [Advancing Denver's Handgun Intervention Program through Action Research](#)

#### [Attribution of tire marks via their elemental profile](#)

#### [Improving Measurement of Community Safety Perceptions with Enhanced Data Inclusivity and Novel Use of Small Area Estimation through Respondent Driven Sampling: A Pilot Study in Detroit, Michigan](#)



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