

**South Dakota NASA EPSCoR 2017 Major Research Grant
(Approved for 2018 funding)**

South Dakota investigator(s) and affiliation	Project title	Funding summary	NASA, Industry, and other partners
<ul style="list-style-type: none"> • <u>PI at SDSM&T</u>: Edward F. Duke, Director SD NASA EPSCoR • <u>Science PI at SDSMT</u>: Yanxiao Zhao • <u>Co-I's at SDSMT</u>: Hao Fong, Charles Tolle, Zhengtao Zhu • <u>Co-I's at SDSU</u>: Manki Min, Hyeun Joong Yoon • <u>Co-I at USD</u>: Moses Ikiugu 	Wireless Body Area Network in Space: Development of Wireless Health Monitoring System with Flexible and Wearable Sensors	<p>\$750,000 (NASA)</p> <p>\$375,000 (Match)</p>	<ul style="list-style-type: none"> • NASA Johnson Space Center • NASA Glenn Research Center • NASA Ames Research Center • NASA Langley Research Center • ILC Dover • L3 Communication Systems-West • Nanopareil LLC • San Diego State University (CA)

Project Summary

Wireless Body Area Network in Space: Development of Wireless Health Monitoring System with Flexible and Wearable Sensors

The goal of this project is to develop a wireless body area network combined with flexible and wearable sensors that will comprise a health monitoring system for spacesuits. The project is directly related to priorities in the Human Exploration and Operations Mission Directorate and the Space Technology Mission Directorate of NASA. To address our goal, we have assembled a multi-institution and multidisciplinary research team from South Dakota School of Mines and Technology (SDSM&T), South Dakota State University (SDSU), and University of South Dakota (USD), along with collaborators at four NASA research centers (Johnson Space Center, Glenn Research Center, Ames Research Center, and Langley Research Center) and three industry partners (ILC Dover, L3 Communication Systems-West, and Nanopareil LLC). This collaboration is well positioned to address the grand challenges in technology and science of wireless communication, sensor development, nanomaterials, and occupational health for a next-generation health monitoring system relevant to NASA missions.

This project proposes an integrated research plan to (1) design and implement a robust, efficient, and secure wireless body area network of sensors for collection and transmission of real-time and multi-dimensional physiological data of human bodies; (2) develop prototype wireless sensor nodes of wearable biomedical and strain sensors that are lightweight, conformable, flexible, and stretchable; (3) integrate innovative wearable sensor nodes into the wireless body area network and evaluate the performance of network; and (4) build new research infrastructure and capability for wireless sensing systems and flexible sensor development in South Dakota. In addition to the research goals, the other objectives of the project are (1) to provide high-quality research and education for K-12, undergraduate and graduate students; (2) to strengthen the science, engineering and healthcare programs at SDSM&T, SDSU and USD; (3) to foster close partnership with NASA research centers, industry, and academia; and (4) to initiate new technology commercialization and promote economic development in South Dakota.

The outcome of the project will enable a wireless network system for real-time and multi-dimensional monitoring of the physiological parameters of the human body, which will provide key technologies for evaluation of health impacts of the space environment on astronauts. Additionally, this project will contribute significantly to the research and education infrastructure of South Dakota, further strengthen the relationship with NASA by creating recruitment opportunities for NASA research centers, and promote economic development in the state. These outcomes are directly relevant to NASA's Technology Roadmap area TA 6: Human Health, Life Support and Habitation Systems; as well as other areas including TA 4: Robotics and Autonomous Systems; TA: 8 Science Instruments, Observatories, and Sensor Systems; and TA: 12 Materials, Structures, Mechanical Systems, and Manufacturing. This project is also directly related to research foci of the "2020 Vision: The South Dakota Science and Innovation Strategy" in Human Health and Nutrition, Materials and Advanced Manufacturing, and Information Technology and Cyber Security.

NASA received a total of 52 proposals for this solicitation. From these, 25 were recommended for funding (13 in 2017 and 12 in 2018.)

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