

# Vital Sign Monitoring Using Non-Invasive RFID Technology

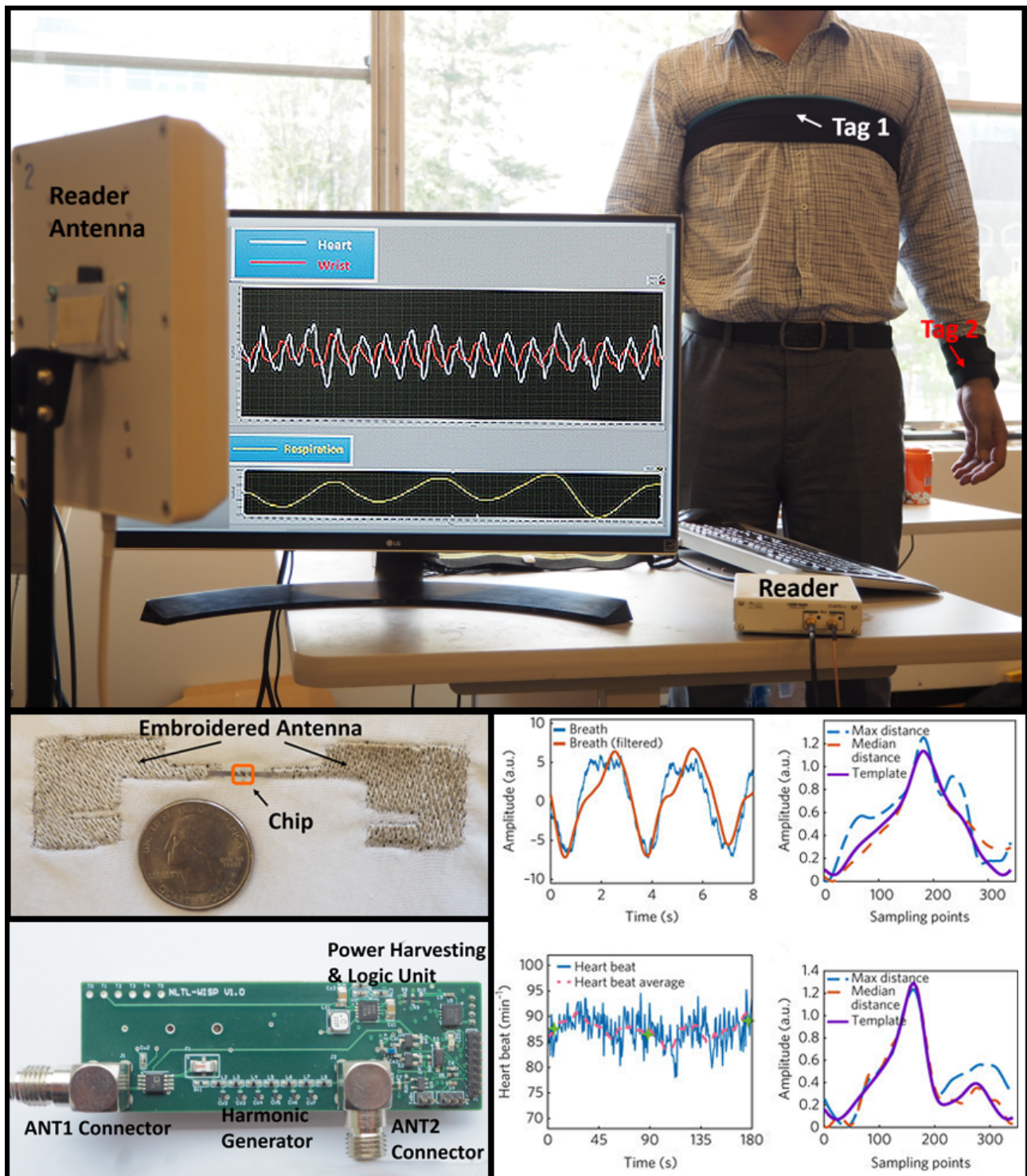
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## Technology description

Cornell researchers have developed a non-invasive and low-cost method to monitor vital signs using passive and active radio frequency (RF) transmissions. Our method uses small non-invasive RFID sensors that accurately monitoring and broadcast vitals to a powered RFID reader.

We have developed a method that opens up new opportunities for vital sign monitoring with accuracy, comfort, convenience and low cost. This technique can be implemented with a passive tag which monitors backscattering or as an active tag antenna which observes reflection and can simultaneously sense multiple points and/or multiple people.

The wearable device consists of an antenna connected to a small contactless RFID chip; the antenna powers the device through energy scavenging. As a secondary function, the antenna senses both subtle and large movements within the body. When placed in the vicinity of the chest the device monitors the body' s physical movements, allowing respiration rate, breathing effort, and the wearer' s heartbeat/pulse to be measured.



The high sensitivity of this device and method can differentiate between large physical movements and smaller internal movements. Such precision enabled the monitoring of a wearers wrist pulse, when the device is placed near the wrist. Estimation of the blood pressure is obtained by combining the wrist pulse data with the wearer' s heartbeat data.

The position of multiple tags can be determined with millimeter resolution

Keywords: Physical Sciences, Engineering, Consumer Products, Energy, Device Manufacturing, Measurement, Computer Hardware, Input devices, Output devices, Mobile Device, Computer Software, Analysis, Applications, Mobile App, Networking and Communications, Wireless Devices, Electrical Engineering, Applied Power & Devices, Sensors, Signal Processing, IoT (Internet of Things), Computer

Science, Computer Engineering, Hardware, Software, Algorithms, Apparel, Wearable Technology, Clothing, Life Sciences, Measurement, Cardiovascular, Respiratory, Medical Devices, Medical Diagnostics (in Vitro)

#### Publications

Xiaonan Hui & Edwin C. Kan, "Monitoring vital signs over multiplexed radio by near-field coherent sensing" Nature Electronics, Volume 1, 74–78 (2018) [doi:10.1038/s41928-017-0001-0](https://doi.org/10.1038/s41928-017-0001-0)

"Near-Field Coherent Sensing Used to Monitor Vital Signs" , InCompliance Magazine, November 2017 <https://incompliancemag.com/near-field-coherent-sensing-used-to-monitor-vital-signs/>

"Cornell researchers monitor blood pressure with RFID" , RFID 24-7 Magazine, December 2017. <http://rfid24-7.com/2017/12/26/cornell-researchers-monitor-blood-pressure-with-rfid/>

#### Application area

Consumer health monitoring devices

Home monitoring of health markers

In-Patient/Clinical monitoring devices

#### Advantages

Passive tag complies with current RF protocols

Unique code of each tag allows monitoring of 200+ tags with one reader

Uses passive harmonic RF identification (RFID) tags

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