

## Accepted Manuscript

Title: Passive microwave resonant sensor for detection of deep tissue injuries

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PII: S0925-4005(18)31522-3  
DOI: <https://doi.org/10.1016/j.snb.2018.08.084>  
Reference: SNB 25231

To appear in: *Sensors and Actuators B*

Received date: 9-4-2018  
Revised date: 21-7-2018  
Accepted date: 17-8-2018

Please cite this article as: Moghadas H, Mushahwar VK, Passive microwave resonant sensor for detection of deep tissue injuries, *Sensors and amp; Actuators: B. Chemical* (2018), <https://doi.org/10.1016/j.snb.2018.08.084>

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# Passive microwave resonant sensor for detection of deep tissue injuries

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## Highlights:

- A wearable passive microwave sensor was developed to detect lesions deep in the human body
- Lesion phantoms as small as 0.5 mL can be detected by the sensor
- Lesion phantoms can be detected through a layer of human tissue that is thicker than 140 mm
- The increase in lesion size resulted in an increase in lesion score
- The sensor may be effective in detecting lesions early in their development, thus allowing for early intervention to reduce the impact of disease.

## Abstract

Deep tissue injuries (DTIs) are a perilous class of pressure ulcers in people with reduced mobility and sensation such as the elderly and people with spinal cord injury. DTIs initiate at deep bone-muscle interfaces and progress outwards, causing extensive tissue damage prior to their visual detection at the skin level. Here, we present a wearable sensor for detecting DTIs at their early stages of development. The sensor emits a 0.1 milliwatt microwave to the depth of tissue and its impedance is monitored at different times. The impedance variations are analyzed and a single assessment parameter is generated for monitoring the presence of DTI and its stage of progression. This sensor can detect lesion phantoms as small as 0.5 mL through a layer of tissue which is thicker than 140 mm. The proposed sensor has the potential to be used as a low-cost prognostic device for DTIs, tumors or blood clots.

*Keywords:* Microwave sensing, Wearable sensor, Pressure ulcer, Deep tissue injury

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