QUEEN'S UNIVERSITY BELFAST

CWI CENTRE FOR WIRELESS INNOVATION

MULTIPLE PROPAGATING MODE WEARABLE ANTENNAS FOR MEDICAL APPLICATIONS

Need

The healthcare sector is experiencing a drive for 24x7 wireless medical care, in which biological sensors included in rapidly shrinking wearables and implanted medical devices track more conditions of patients, for example temperature, oxygen or pH inside the body. The need to transmit this type of data 'wirelessly' is needed to radically improve treatments, such a chemotherapy efficacy.

New biosensors and sensing techniques are emerging, but the problem with wearable and implant sensor communications is that they only work under certain very specialist circumstances. Not working means that the sensor acquires the data, but the data set cannot be detected, gathered and used outside the human body, rendering it useless.

The CWI researchers have developed a new type of antenna technology that will enable continuous medical monitoring for everyone, in a way that wasn't possible before, providing peace of mind to patients and their families. They have identified the limiting factors in their performance and can demonstrate that their prototyped solution solves this problem. Existing antennas provide at most 10% communication coverage outside the body, whereas their solution gives 100% coverage. This is the enabling technology for future wireless (remote) monitoring of bio-sensors.

Current systems require trained user input to use the device, whereas our solution takes the user out of the equation, hugely reducing any risk, but also improves the use and performance of sensing technology, enabling non-specialists to fit the bio-sensor and more frequent monitoring, anywhere, through connectivity to a wireless network. As implants go deeper into the body, this antenna technology could be the difference between a surgical procedure being successful or not.

Approach

The CWI researchers have identified a unique pattern in the radio waves from implanted devices. They have prototyped a special antenna concept that can pick up these propagating electromagnetic waves close to the surface of the body from an implant in any orientation. The prototype is a lab-based demonstration that validates the research concept and claims. On a human tissue representative test-bed developed at CWI, our researchers could successfully demonstrate communication from their antenna to an implantable sensor, deep inside tissue at medical frequency bands with 100% unparalleled communication coverage.

Our researchers believe that this technology will bring a huge improvement to the medical market, enabling new wireless sensing capability in and outside the hospital, truly delivering on the promise of the 'Connected Health' concept, enabling people to monitor their own health everywhere, causing a surge of emerging wireless lifestyle technology onto the consumer market. Furthermore, the technology will also be applicable to other market segments such as animal bio-sensing, automotive, and wireless environmental sensing, such as inside concrete.

Results

1. The first wearable antenna with a very high level of performance that delivers more than existing antennas, and takes out guesswork and mitigates the risk of placing the implant incorrectly, giving a more secure and reliable communication link to the implant over time.
2. 100% improvement factor over incumbents antennas for wearable and implantable biosensors.

Demo video

http://go.qub.ac.uk/PhantomTestBed

Publications

2018 IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting - APSURSI2018 - The Westin Boston Waterfront, Boston, USA

Patents

1. UK Application No PG17175GB00 (May 2018)

Researchers

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Technology readiness level

1 2 3 4 **5** 6 7 8 9