A Wireless, Fully-Passive Recorder for Medical Applications

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We present a fully-passive wireless neurorecording system for monitoring very low level neuropotentials. The subject recording device has no battery, power harvester or regulator. As a result, it addresses concerns related to: (1) external wired connections (causing lack of mobility and risk of infection in patients), and (2) heat generation that may impact neural functioning.

The developed sensor exhibits extremely high sensitivity down to 20 Vpp. This minimum detectable voltage is 25 times lower than previous fully-passive wireless neurorecorders. Further, for the first time, the developed sensor exhibits large bandwidth, allowing detection of signals up to 5000 Hz. As a result, it can detect all neural signals of interest.

A key aspect of the proposed sensor's increased sensitivity is the introduction of an anti-parallel diode pair (APDP) to greatly reduce the second harmonic mixing conversion loss in the implant. Also, a miniaturized antenna allows for a less intrusive implant that currently exhibits a footprint of only 9mm x 10mm. The implant is excited by an external interrogator, possibly integrated within a baseball cap, to power the implanted recorder and read the neuropotentials.

The next obvious step in this research is to pursue multichannel implementation of the developed low loss and high sensitivity neurosensor. Such multichannel realization will provide for an understanding of brain activity related to epilepsy, paralysis and injuries. The eventual goal is to provide external stimulation that can help restore brain functionality.

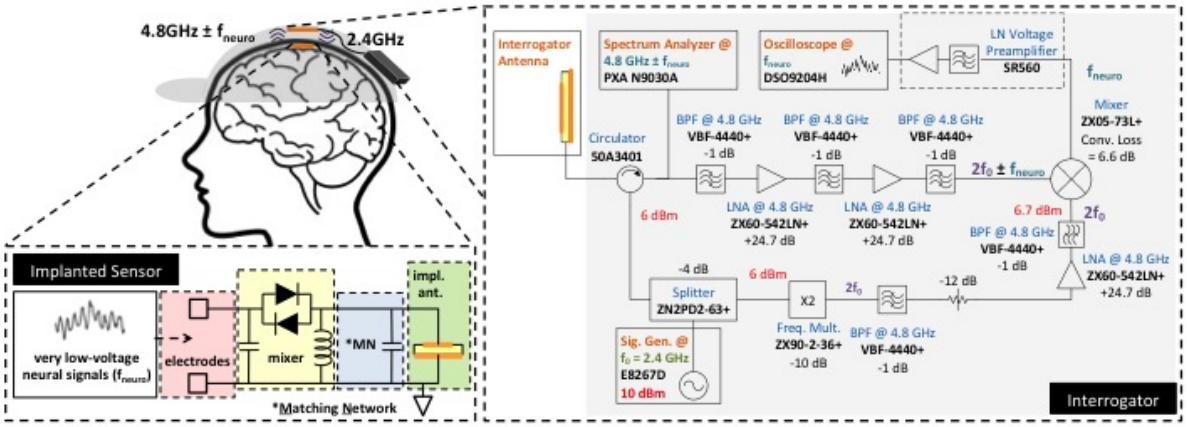

Figure 1: System block diagram.