Single-Channel Microsystem for the Recording of Biopotentials From Motor Cortex of the Brain

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There is growing interest in recording neural activity in the motor cortex of the brain on a long-term basis. The realization of micro-systems for this purpose requires the successful integration of high-density electrode arrays, cables for connecting the electrode signals to integrated amplifiers, an implantable signal processor for separating the signals of interest (neural spikes) from background noise, and an inductively coupled wireless link to transmit the neural signals to the outside world. A single-channel microsystem for performing these functions is in development. A neural signal is amplified, properly filtered, and delivered to a spike detector chip that identifies the neural spikes. The generated serial bit stream is transmitted to the outside world over a reverse telemetry wireless link.

To realize the system, a passive microprobe, a miniaturized ribbon cable, a signal conditioning chip, a spike detector chip, a telemetry chip, and an off-chip SMD resonator are assembled on a silicon platform, as shown in Figure 1.

Figure 2 shows the system's output from an *in-vivo* experiment, in which the sensed signal is preconditioned, its negative spikes (true neural activity) are detected, and the neural spikes only are telemetered to the outside world.

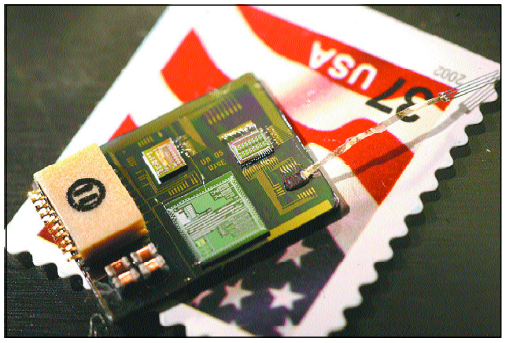

Figure 1 – Single-channel cortical recording prototype system on a silicon platform.

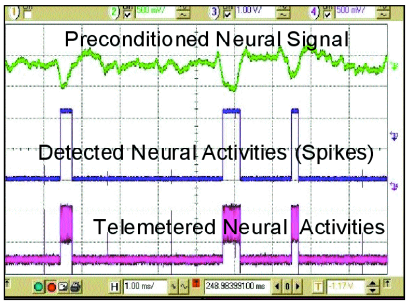

Figure 2 – System results from in-vivo experiments.