A Wireless Implantable Microsystem for Multi-Channel Neural Recording

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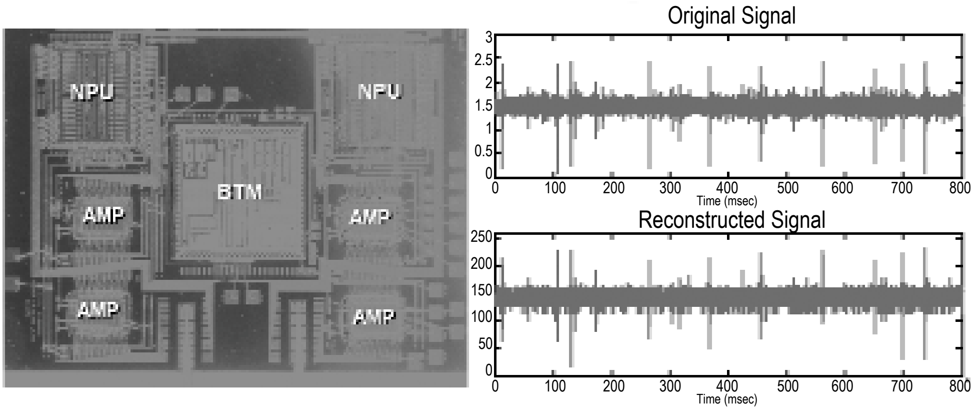

The generation-1 microsystem integrated on a penny-size silicon platform.

High-density arrays of silicon-based microelectrodes for recording single-unit neural activity in the central nervous system are widely viewed as a promising path to revolutionary progress in understanding neural functions and to neural prostheses. This project is developing a fully programmable multi-channel intracortical recording microsystem. The entire system is powered and controlled using an inductive bidirectional wireless link and transmits the processed neural activity to the outside world. In this system, neural signals from the recording sites are amplfied, properly filtered, and delivered to a neural processing unit. The microsystem has two modes of operation. In the *Scan Mode*, the system simultaneously records single-unit neural activity on all the neural channels. In the *Monitor Mode*, the system is capable of digitizing two channels with 8b resolution so that the neural waveforms can be viewed externally. The generation-1 microsystem is assembled inside a micromachined silicon platform measuring 1.4cm by 1.55cm and weighing 275mg. The Gen-1 version of the system has recorded chronic single-unit neural recording from the motor cortex of a guinea pig with a signal-to-noise ratio of 8.7. Design of the generation-2 microsystem is currently in progress. A bidirectional wireless interface chip has also been designed, fabricated, and tested, and the mixed-signal central processing chip is in the design phase. This project is supported by the Engineering Research Centers Program of the National Science Foundation under award number EEC-9986866 and by a gift from Ms. Polly Anderson.