Brain Wave Monitoring Provided for the Home

At the 2011 Medical Device & Manufacturing conference and exhibition in Anaheim, imec and Holst Centre presented breakthroughs in enabling technologies for wireless EEG (electroencephalogram) systems that allow for continuous ambulatory monitoring. The demonstrated EEG headset is compatible with dry electrodes and combines ease-of-use with ultra-low power electronics. The prototype headset records high quality EEG signals and wirelessly transmits the data in real-time to a receiver located up to 10 m from the system.

Medical applications that can be envisioned with this EEG prototype system include early warning system for epileptic patients or brain typing enabling people with motoric disabilities to communicate.

At the heart of the system is imec's 8-channel ultra-low-power analog readout ASIC (application-specific integrated circuit). The ultra-low power readout ASIC consumes only 200 µW and features high common mode rejection ratio (CMRR) of 120 dB and low noise (input referred noise of 55 nV/?Hz). These performances are achieved at high input impedance (1 G?), which makes it compatible with the use of dry electrodes. The electronics, including ASIC, radio, and controller chips, are integrated in a small wireless EEG system of 25 x 35 x 5 mm and can easily be embedded in headsets, helmets, or other accessories. The signal to noise ratio of the system is 25 dB on real EEG signals. The entire system consumes only 3.3 mW for continuous recording and wireless transmission of one channel, and 9.2 mW for 8 channels. This gives between 1.5 to 4 days of autonomy on a small 100 mAh Li-ion battery, depending on the mode of operation.

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