Imec unveils innovative technology for an ECG patch

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ECG patch, combining an ultralow-power ECG SoC with Bluetooth Low Energy.

Imec and Holst Centre announce an innovative body patch that integrates an ultra-low power electrocardiogram (ECG) chip and a Bluetooth Low Energy (BLE) radio. This unique combination fuses power-efficient electronics and standardized communication, opening new perspectives for long-term monitoring in health, wellness and medical applications. The system integrates components from imec and Holst Centre's Human++ R&D program. It is designed in collaboration with DELTA and integrated in DELTA's ePatch platform.

The ECG patch measures up to 3 lead ECG signals, tissue-contact impedance and includes a 3D-accelerometer for physical activity monitoring. The data are processed and analyzed locally, and relevant events and information are transmitted through Bluetooth Low Energy.

The patch is capable of monitoring, processing and communication on a minimal energy budget. When computing and transmitting the heart rate, the entire system consumes a mere 280µA at 2.1V, running continuously for one month on a 200mAh Li-Po battery. When transmitting accelerometer data (at 32Hz) on top of the heart rate, the power consumption remains below 1mA in continuous operation, giving about 1 week of autonomy.

The BLE link adds a standardized plug-and-play communication gateway to mobile devices such as smartphones and tablets. Smartphones and tablets enabled with Bluetooth 4.0 have been announced for next year; these will be your gateway to the world, bringing your heart parameters to wellness applications, to your network of friends, or to your doctor.

At the heart of the patch is an ECG System-On-Chip (SoC), a mixed signal ASIC. It is custom designed to provide ECG monitoring and high processing power at an extremely low energy consumption. Next to monitoring 1- to 3-lead ECG, the ECG SoC also monitors the contact impedance, providing real-time information on the electrode contact quality. This can be used to evaluate the quality of the ECG measurement and to filter motion artifacts. The ECG SoC has been designed to run algorithms for motion artifact reduction (based on adaptive filtering or principal component analysis) and beat-to-beat heart rate computation (based on discrete or continuous wavelet transforms). It has additional computation power to run application-specific algorithms such as epileptic seizure detection, energy expenditure estimation or arrhythmia monitoring. The built-in 12-bit ADC is capable of adaptivesampling – sampling QRS waves at high frequency, and the other waves at a lower frequency – achieving a compression ratio of up to 5.

Within the Human++ program, imec and Holst Centre develop intelligent wearable sensing solutions addressing the needs for a better

and more efficient healthcare. A prime example is the wearable ECG patch combining imec's ultra low power electronics with DELTA's ePatch technology. This first-of-a-kind demonstrator opens up new opportunities for companies active in wireless health.

Source: IMEC