

FRAUNHOFER INSTITUTE FOR INTEGRATED CIRCUITS IIS

PRESS RELEASE

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At the MEDICA, Fraunhofer IIS is introducing the FitnessSHIRT, a smart wearable for reliable performance diagnostics

Erlangen/Düsseldorf, November 16–19, 2015 – MEDICA, hall 10, booth G05: The Fraunhofer Institute for Integrated Circuits IIS is introducing the FitnessSHIRT during the MEDICA trade fair. This smart apparel can continuously monitor various body signals in mobile application scenarios. The shirt can be worn during daily routine, is washable and features integrated sensors that measure the pulse and respiratory rate simultaneously.



The FitnessSHIRT developed by Fraunhofer IIS measures the pulse, respiratory activity and exercise intensity. © Fraunhofer IIS/Kurt Fuchs | Picture in color and print quality:

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While jogging in the forest, the measurement belt is strapped tight around the chest, almost too tight. After one kilometer you develop a bad conscience. Although the pulse is in line with what the device shows, you can't be sure if your respiratory rate is okay. And is the heart rate adjusting to the exertion level? There's a much simpler way: put on a FitnessSHIRT, activate an app on the smartphone and just like that, you can begin continuously-monitored training.

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The latest stage in the evolution of connected apparel

Even the FitnessSHIRT, the latest stage in the evolution of smart and connected apparel, doesn't work up sweat when exercising. The snappy and comfortable FitnessSHIRT is even more than just something you can easily slip on or wear under everyday clothes. "The integrated sensor technology means that for the first time, the pulse, respiratory activity and exertion level can be measured, analyzed and clearly displayed on an app," explains Christian Hofmann, Group Manager of Medical Sensor Systems at Fraunhofer IIS. "That makes the FitnessSHIRT unique."

Textile electrodes capture body signals

Manufactured into the fabric of the T-shirt are special conductive materials that support easy and continuous monitoring of physiological signals without wires or cables. Textile electrodes capture the electrical activity of the heart muscle (EKG), but without constricting the body like a corset. An elastic measurement strap placed on the chest records the respiratory rate. The system also registers key statistics such as body posture or the duration and intensity of the physical activity.

The technical heart of the FitnessSHIRT is a small housing for the sensor electronics that is attached to the shirt with a snap fastener and which also contains a fall detector and the power supply. After removing the housing, the T-shirt can be thrown into the washing machine.

The combined analysis yields significant advantages, says Hofmann: "The raw data captured by the system – in other words the EKG – can be used to derive the heart rate, the heart rate variability (HRV) and the inhale and exhale duration in one single process." The HRV is a more precise analysis of the EKG signals and allows a more in-depth analysis of how the heart rate adjusts and recovers after exertion. It also serves as a foundation for evaluating stress and relaxation states.

The data is transmitted via wireless technology to a smartphone or smart watch. "Because it filters interference signals, the sensor module delivers precise and reliable performance statistics, even for active wearers in mobile environments."

For athletes, rehab patients and first responders

The FitnessSHIRT opens a wide range of application possibilities. It helps both amateur and top athletes to carry out their training programs in a correct, efficient and optimal fashion and helps to avoid overexertion. The FitnessSHIRT can also be used to keep rehab and high-risk patients from exceeding their physical activity limits. The HeartBike, an intelligent Pedelec developed by HeartGo GmbH, receives the heart signal from the FitnessSHIRT worn by a cyclist and regulates the operation of the electric motor to provide a sufficient training incentive without overexerting the body. The system analyzes and documents the training progress and stores potentially critical events for later scrutiny. In nursing environments, conventional patient monitoring and for stress and relaxation management programs, the intelligent wearable is well-suited for achieving positive health effects and providing the basis for a healthy lifestyle. Last but not least, it can help improve security for first responders working in hazardous situations by monitoring their vital functions.

Mainz-based ambiotex GmbH has already licensed the FitnessSHIRT and plans to introduce it to the market at the beginning of 2016. Application partner HeartGo GmbH will be demonstrating the HeartBike in conjunction with the FitnessSHIRT at the Fraunhofer-Gesellschaft exhibit booth (hall 10, booth G05).

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The **Fraunhofer-Gesellschaft** is the leading organization for applied research in Europe. Its research activities are conducted by 66 institutes and research units at locations throughout Germany. The Fraunhofer-Gesellschaft employs a staff of nearly 24,000, who work with an annual research budget totaling more than 2 billion euros.

The **Fraunhofer Institute for Integrated Circuits IIS** is one of the world's leading application-oriented research institutions for microelectronic and IT system solutions and services. It ranks first among all Fraunhofer Institutes. With the creation of mp3 and the co-development of AAC, Fraunhofer IIS has reached worldwide recognition. In close cooperation with partners and clients the Institute provides research and development services in the following areas: Audio & Multimedia, Imaging Systems, Energy Management, IC Design and Design Automation, Communication Systems, Positioning, Medical Technology, Sensor Systems, Safety and Security Technology, Supply Chain Management and Non-destructive Testing. About 880 employees conduct contract research for industry, the service sector and public authorities. Founded in 1985 in Erlangen, Fraunhofer IIS has now 13 locations in 10 cities: Erlangen (headquarters), Nuremberg, Fürth, Dresden, further in Bamberg, Weischenfeld, Coburg, Würzburg, Ilmenau and Deggendorf. The budget of 120 million euros is mainly financed by projects. 23 percent of the budget is subsidized by federal and state funds.

Detailed information on: www.iis.fraunhofer.de/en