

**csem** swiss center for electronics and microtechnology

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*technologies for innovation*

# Content

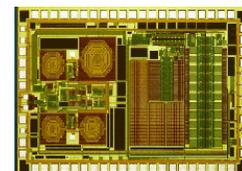
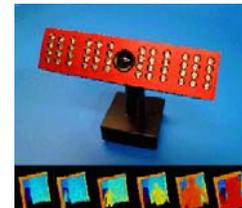
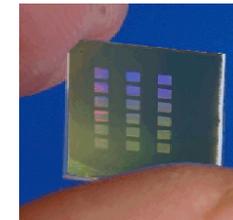
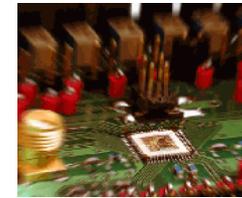
- Technology Portfolio
- Control & Signal Processing
- Related Activities



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## CSEM active fields

- Micro and low-power electronics
- Biomedical engineering
- Photonics and optoelectronics
- Mechatronics and microrobotics
- Nanotechnologies
- **Systems engineering**



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CSEM system engineering division

## Control and Signal Processing

### Speech enhancement and recognition

- hearing aids applications
- speech synthesis
- voice command systems



### Sensing, event detection and classification

- pacemakers
- home care systems for the elderly



### Physiological parameter monitoring

- ECG, EEG, SpO<sub>2</sub>, NIBP, HR, physical activity, RESP, etc.
- telemonitoring systems



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## Heart Rate Monitor – PULSEAR (industrial)

- **Objective**

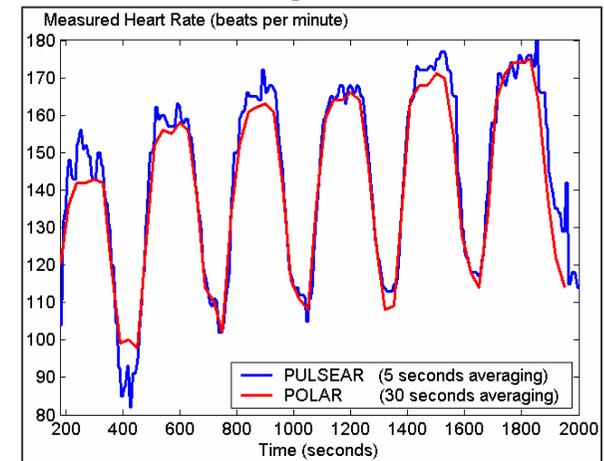
- integration of HR monitor into earphone without additional inconvenient probe

- **Technology platform**

- optical sensing of pulsatile blood flow
- acceleration sensing for motion artefacts removal
- pulse detection processing

- **Key features**

- comfortable and non-invasive method
- robust and reliable pulse detection (motion artifact cancellation)
- low-power consumption
- integration of activity monitoring



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## Hemodynamic sensor (EURO)

### ■ Objective

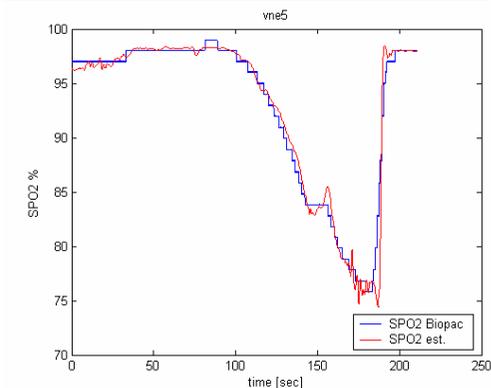
- Development of a robust, non-invasive oxymetry sensor to monitor thrombosis-prone patients

### ■ Features

- Differential (two spots) SpO<sub>2</sub> measurement
- Active artefact cancellation for long term monitoring under real life conditions

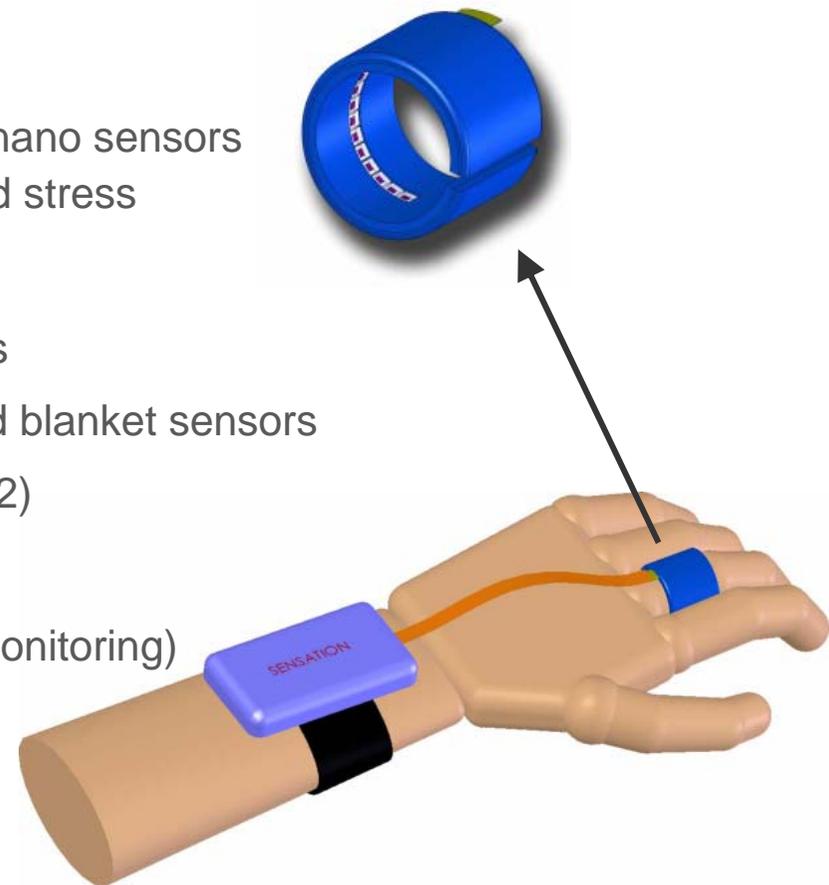
### ■ Results

- Preliminary breadboard monitoring system
- Algorithmic development and database generation
- Sensors and electronics design



## Ring sensor (EURO)

- **Project Framework**
  - development of wearable micro and nano sensors to estimate the person's vigilance and stress
- **Objectives**
  - development of wrist and ear sensors
  - textile based sensors: bed, pillow and blanket sensors
  - realization of finger ring sensor (SpO<sub>2</sub>)
- **Features**
  - portable and wearable (continuous monitoring)
  - robust to movement artefacts
  - robust to external light artefacts



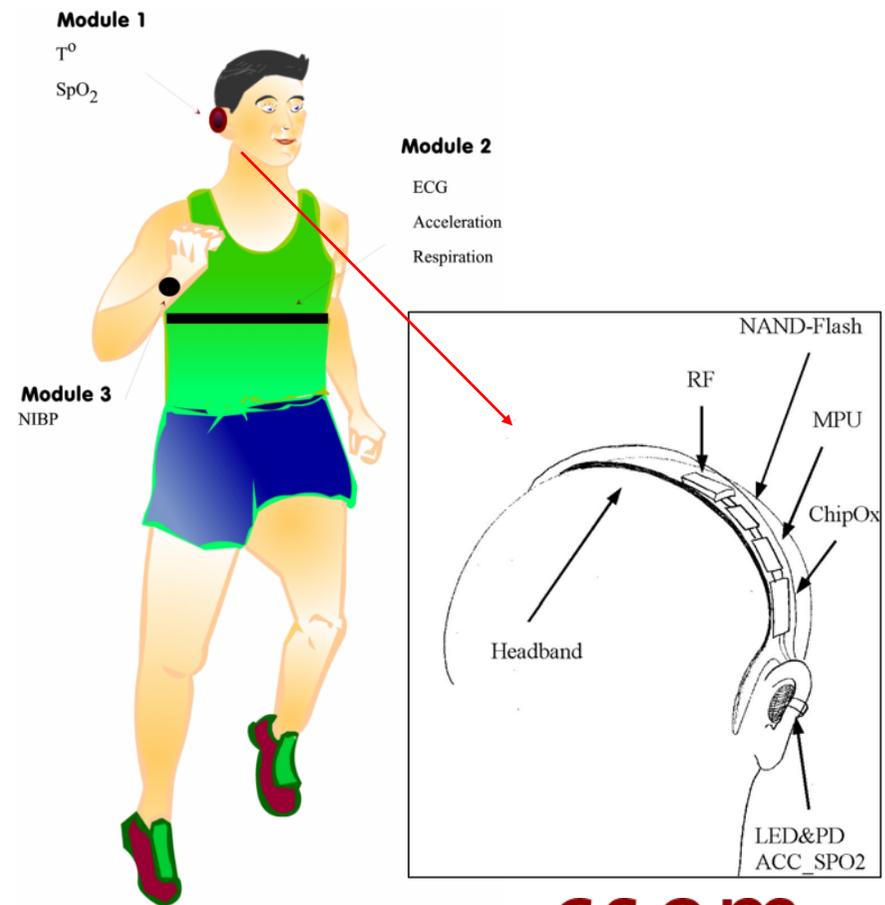
## Long term medical survey system (ESA)

### ■ Objective

- architecture design of intelligent patient monitoring system

### ■ Features

- monitoring of human vital parameter such as ECG, SpO<sub>2</sub>, Respiration, activity and NIBP
- wireless communication to base station
- validation software on physician processing station
- data management system
- data transmission from Concordia to Europe



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**Thank you for your attention.**

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